

Build Your Own Eval Tools With Notebooks!

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SUMMARY

The discussion centers around the innovative features of the MIMO notebook, emphasizing its reactivity, interactivity, and the integration of various tools that enhance data science workflows. The speakers explore how MIMO allows for a more intuitive and efficient coding experience, particularly for teaching and data analysis.

- MIMO notebooks support reactivity, allowing cells to automatically update based on changes in other cells, enhancing workflow efficiency.*
- The integration of widgets, such as scatter plots and annotation tools, enables interactive data exploration and visualization.*
- Users can create custom widgets using the Any Widget library, which works across different notebook environments, promoting flexibility.*
- The discussion highlights the importance of ergonomic tools and practices to prevent repetitive strain injuries in programming.*
- MIMO's structure allows for easy integration with AI tools and data sources, facilitating advanced data analysis and machine learning tasks.*
- The platform supports exporting notebooks in various formats, including HTML and IPython, for easy sharing and collaboration.*
- The speakers emphasize the potential for creativity and innovation within the MIMO environment, encouraging users to explore new ways of working with data.*
- Future developments may include AI-generated widgets and enhanced features for collaborative data science projects.*

tons of times. Yeah, I can share my entire screen. Like the main thing you need to have this UR like this backup URL and the stream link basically and that you can get from YouTube. So if you're on the YouTube thing Oh, we're already live. Oh, wait. I think I lost. Okay. well, I I think we are already live, but that's not Yeah, we already live. Yeah. So, hi everyone. I mean, if anyone's watching, I don't Yeah, like there people I mean people are people are early like Dutch people tend to be early, you know. You should I wish you could stream directly to Twitter like in the spaces if you could like stream directly into there. you want to stream to all the places having one single button just stream everywhere.

Yeah. Yeah. Yeah. Yeah. Is there is there a thing? Do you know? I've never really tried it. I've only done YouTube myself. Like the one thing is that all these platforms are slightly different. So like if you have Twitch then there's like this sponsor thing that you can hook into and then people can pay you as you stream and that doesn't work the same way on YouTube, doesn't work the same way on Twitter. So then all these experiences are kind of different and like there's a middle ground, but then you go for the middle route and it's like a master of none kind of a feeling is what I'm what I've been told. I see. I'm going to turn on my light real quick. One

second.

So, the auto camera is following. Hamal, turn on the light. It's funny how the camera is also following you as you walk to the door and then to the light. Yeah. I mean, it's all this AI stuff, right? Like, yeah, it is trying to be fancy. but how's Because you're you're not in Silicon Valley, right? You're in Oregon, if I recall correctly. No, I'm in Oregon. I'm in Silicon Forest. They like, but there's not really any Silicon going on here. There's not much going on here in terms of tech. but yeah, it's cool. It's peaceful. You know, I can also imagine it being somewhat of a relief. Like one of my So, I live in this, this is kind of like a working-class neighborhood kind of where I live. And there's this one guy who's single and whenever it's like nice weather, he has a bench and he just puts a creative beer there and the entire street just kind of goes for a pint basically. But that guy is a painter and he has never been on LinkedIn in his life. And part of me does kind of go like so good. I know, right? But also like when he's hanging out with his buddies like they're painters and plumbers and stuff and they're cool people, but they know nothing about tech. Like the guy bought his first laptop two years ago when he became independent just to give like a an overview of the crowd. And I got to say, oh man, I love being able to unplug from tech. Like just hanging out with those guys for a bit. Something about that feels very healthy. So where do you live again? So you know Amsterdam, right?

Yeah. Between Amsterdam and the beach, there's a little city called Harlem, which is also, by the way, why Harlem in New York is called Harlem. It's basically named after that city. It's 300,000 people. It's close to the beach. It's a cool place to raise kids, but you're still close to Amsterdam. So if people visit, you can always say hi. I think that's kind of the the sweet spot for me. And you have kids? I've got a little rascal named Kai. He's turning three soon, which is a really cool age, but it's Oh my god, he touches everything and things can break now cuz he's kind of big.

Yeah. I'm going to actually like be right back. use the restroom real quick. I'll be right back. One second. Sure. I'm gonna show off my gear to people who are tuning into the live stream. Fancy keyboards and all that. Actually, let's see if I can actually go to that live stream now because then I might see people comment. That might actually be kind of interesting.

Oh, no. That's that's different. That's vanishing gradients. Oh yeah, build your own email tool. Okay, I'm in the YouTube. Yay. That's kind of funny. So, hi everyone. Feel free to leave a comment if you want to say hi and stuff. We definitely started early. Like Hamal just figured out the the stream button and that's why we're kind of early, but we're going to start in like just a bit. while HML is away, people can ask me questions about the setup that I've got here, but we're going to start in like five minutes.

All right. Hello. I've been looking forward to this, by the way. Like, this is a different beast because I don't know. Like, when I thought about this this talk, I was like, "Oh, this sounds like so much fun." Like, I'm gonna have fun right now. which is not always like sometimes there's different variations of fun, but like this idea of like hooking up a I mean to a notebook just sounds like so much fun. So besides the whole like oh my god Vincent found a way to get engineers to expense their notebook like their their game pads and like that that's awesome like that that's definitely a part of it but like part of it is also and that's also why I want to start with this scene

like I've had RSI issues and some of that was prompted because I was annotating a lot of mouse work basically and I really injured my wrist in doing so and part of me does think this game pad as far as ergonomic goes it's pretty brilliant if you think about it like it really fits in the hand like the shape of your hand so not annotating with something like this also feels kind of crazy if you think about it. So that's also like there's also like a serious reason why I investigated this to be honest. But yeah, the the fun bit is definitely also u part of it. And so I brought my controller as well. I have a PS5. I don't know if that'll work. I have a USB cable, USBC cable.

It's kind of long, but whatever. Yeah. So I mean you can yeah, you should be able to play around live. that that should be doable. one thing you do want to do is plug it in, I think, and just check like your Mac settings if it can detect that Bluetooth device. That's sometimes an issue. I think in general, if you hook it up, then the Bluetooth is no longer a theme. But I don't own a PS5, so like it's sometimes a I own it, but I don't ever turn it on because I don't have time for it. I I don't even know why I own I have it. It was like it played one game and then that was it.

It's I mean the annotation game is a fun one in general but we are going to start soon so I got to have OBS in front of me. Yes. And do you have a hard stop? I don't Oh, I don't like I can go on for a bit longer if if I can go on. I mean Okay. Then I can I can show off more stuff. Yeah. Yeah. Please do. Please show off all the things. okay. I'm going to turn on my controller.

I've never tried to It says allow accessory to connect. Okay, allow. Let's go for yes. Okay. And now what do I do? So if you go into Google and you type mopad GitHub and then coning like my alias Mopad GitHub. Oh wait, it's under your Yep. So it's it's this repository that you want to go to. because MIMO is able to deploy to WOM, I can also host a Marrimo notebook with the widget on GitHub pages. So, you can go to a page like this, hold on your gamepad, move things around, and events are being detected. So, that you should be able to do live right now if you wanted to.

Okay, we're going to come back to GitHub. Let me So, my alias is Conan K O N. So, if you go to github.com like your screen is very low resolution for some reason. it could be because you're looking at the webcam. If it's an issue, I can also just share my screen. By the way, yeah, I can't see the text. I can barely see the text on your screen. Okay, that's not good. So, I'm going to hit share screen.

Open. Oh, it's one of those open system settings kind of a thing. Okay, fine. Zoom. I'm gonna have Yeah, I'm going to quit and reopen. Be right back. One moment. No problem.

I made some of my friends co-host just in case. Always do that. So, don't be alarmed, Jonno or Isaac, that you're now co-host. It's just I just do it in case my connection drops. the meeting doesn't end. Okay. So, we we have prepare something. oh. Oh, no. No. You don't have to prepare anything. It's just I'm the guy who has to prepare something for this meeting. Okay, great. requesting bypass security allow.

Okay, so I think if I'm not mistaken, you should see a higher resolution screen now. That's better. Yes. Okay, now. Okay. So, shame that the OBS virtual camera doesn't work. That's a bit of a bummer because we can't do a

super fancy thing. But as long as people can see what I'm seeing, I would argue everything is still good. is there a way for me to see what everyone else is seeing? How are you switching between screens? So, are you doing this in a video sense or are you doing this in like just with your OS? Like it seems like you're doing some video fancy stuff right now. So, I do have a bit of a setup at the house, but it's also partially because I've got three screens. I've got I've got a drawing tablet pen thing. and like I can actually let me let me start by showing that actually and then we can really get this. Super interesting.

yeah. I know it's a diversion, but this is interesting. I think probably for everybody. Yeah. Hopefully. I mean, it's it's a thing where Okay, let's I'm going to hit video and then I'm going to hit this screen that I've got on top. So, I'm also going to stop sharing my screen and stop share. Okay. So, hopefully people can see this is my desk. My desk is a bit of a mess. Like, yes, it's a mess. If we can get over that. What you see in in the middle here are like it's a split ergonomic keyboard. This is one of those keyboards that has like a a key well attached and that means that your hand can nicely fall in. It also means that your thumb has more than one button to touch.

which is super duper useful. I can map one of these keys to be like my Mac Whisper or whatever. but you can fully program these keyboards. I love these things. I have a YouTube channel where I review these. But, both my hands are split. this keyboard comes with a track ball over here, which is nice. But in the middle, I've got probably the most important thing that I'll use today, which is the a drawing tablet. This is a \$40 UNON drawing tablet. the cheapest thing you will ever find. But I've got an app called Screen Brush that allows me to draw over something that is on display. So I can hit a shortcut, then Screen Brush turns on, and I can draw over something that is on screen. And I'm just going to now start sharing my actual screen again. So I'm going to go to desktop number two over here. This is the screen that we will also be using in a bit. But I can now say like, "Oh, by the way, look at this. I'm pointing an arrow at something." And oh, by the way, here's an important detail that you shouldn't be missing. And especially during COVID, I was just always so surprised that I was the only one in my company usually that made this investment.

But especially if you're working asynchronously, yeah, you can write something up, but what you can also do is like make a two-minute recording where you hover over the thing that's important. And also for educational videos, just this way of working is just so much more clear. Please people, buy these things. Like buy I don't have one. It's it's a \$4 like Mac app you got to pay for. It is the best value you will ever get and I would love for more people to do proper education on the internet which involves buying a little bit of gear. Okay. What is it? It's a I can you buy Waycom? The brand is not necessarily too important. The main thing that's important is this one app.

I can actually draw it in display now. so this is what it looks like. There's this basically this overlay thing and I can just say like oh let's draw over something. You can also draw boxes. I can also hit F and then what I draw just is on screen forever. So if I want to do things like whiteboarding, do a little bit of diagramming. whenever I live stream, I do this all the time. like please make this like \$5 investment and all your videos will be better and the world will be better for it.

Okay, I'll collect the links, Amazon links, I mean not affiliate or anything, just the Amazon links for everyone's

benefit and like put it in the notes of this talk. so so don't worry. There's a there's also a com code course I made like 5 years ago about how I make these videos and that pipes just followed that that also has all the links in it. Oh, okay. You have all the you're using the same gear from that video, the com code one. It's I mean it's I used wakecom tablets before then but it's just like in data science the tools don't matter that much eventually.

It's just a tool. So buy a brand whatever you like and then just focus more on adding context to your videos. That's the important bit. Anyway, I do want to make sure like am I is my face on display now as well? No. no I see your desk and your screen. All right. So then I have to I think select this one. And now my face is back. Right. Yeah. Good. Okay. people can also see this see this notebook over here I think. Right. Yeah.

Good. Then unless you want to do something of an introduction then what I would like to do is maybe tell a story or two. Let's go right into the story. Right. So I started in data science like I don't know 10 15 years ago maybe. It's been a while. And nowadays when people talk about evals people say like look at your data look at your data look at your data. It's a good like lesson. People should definitely do it. But the thing that always struck me that's interesting about it is that I had been doing that for like ages. 15 years ago, it was also a problem. And the best way to explain the problem in my mind is to also talk about this one data set that I I tended to use for teaching. This is the chickweight data set. For those of you that remember, this came with the R language. It's like one of those data sets that R came packaged with. And the data set has weight, it has time, it has a specific chicken. So different chickens are eating a specific diet over time so to say, right? So this chicken had this diet and as time moved forward, this chicken started gaining some weight. Like that's the basically the story. And there's lots and lots of these chickens, right? So as I scroll over here, you can see lots of these chickens basically. and note by the way, what we're looking at here is a MIMO notebook. Whenever you output a data frame, we get a nice interactive widget with lots of bells and whistles.

There's a button over here. We just added it. So, what I could do is I could explore, let's say, the diet column. There's all sorts of descriptive statistics. There's like pretty charts and stuff, especially if you've got a time series. This is very nice. But, of course, we're not going to like stare at a data frame like this. What you typically would do is you would make a chart. So, if you wanted to maybe summarize the data a bit, you would do something that looks a little bit like this. You would basically say like, look, for every chicken over time, we've got this little dot. So, we've got time on the x- axis over here. We've got weight on the y-axis. And then for all of these different diets, we can also make like an average line. So we can see that there's this diet three over here that seems to be doing quite well compared to some of these other diets.

And this is just doing summary statistics. You could also apply tensorflow or scikitlearn if you want to do something fancy and predictive. But what a lot of people would do in data science is they would sort of look at this and go like okay diet 3 is best business case closed. And we have a chart here that shows us that that's accurate. And I would argue that, you know, this is a common practice, but what I've just done is not looking at your data. What I've just done is staring at your data.

Because the number one thing that people always forgot to do whenever they were looking at a chart is that you shouldn't just look at it and then move on. What you should do is you should actually force yourself to look at

the damn thing for like 5 minutes because nine times out of 10, something weird is happening, but you have to look for it. And in this case, because we're using Alter, we can actually do a cool thing.

we can add interactive on the chart object itself. And when we do that, we actually get a chart that we can move around and we get a chart that we can zoom into. And when you do that, suddenly something interesting happens because it seems like there are some chickens over here that are actually losing weight. And you know, presumably this is like a data set with chickens from like a feed lot, so that shouldn't really be happening. And if you squint your eyes, you can actually see another instance of that here. There's a I don't know exact, you can't see right now if this chicken eventually lost weight or if it was a different one, but you do see that there's a point over here that's lower than anything that happened before. So, there are also chickens that are losing weight. And again, that's just kind of weird. That should maybe not happen.

Like that there's kind of a a smell there, right? And whenever you smell something, you should chase it. But one lesson here is you can only chase a smell if you take the time to sniff. And if you took this effort, like if you noticed this one phenomenon, you could make a different chart which is this one. And then you could outline all these different chickens. And then you would definitely notice that some chickens actually died prematurely. So there's one chicken over here that died prematurely. There's another one here, another one here. And like five chickens out of this entire group actually died before, let's say, the final date. H given that what does this line actually represent?

I mean yeah you're going to calculate the mean of all the chickens over here but you're going to not count the five chickens that died prematurely. Therefore this line doesn't matter. And the only way you've got and I I want to stress this the only way you've gotten that conclusion right is if you actually looked at the data and you didn't stare at it. And like that's a lesson I think that we should remind ourselves of also in this day and age of LLMs. Like it's very easy to come up with a flashy demo. But you got to be very critical and maybe what we got to do is come up with tools that help us. So back in the day when I was teaching this for the first time, we had static charts. One thing that's really cool about Altter is nowadays we've got these more interactive charts, right? So I can actually pan and zoom in and stuff.

But interactivity is only part of the story. And what I want to showcase today is how reactivity is actually the cherry on top that you might want as well. before moving on to that though I just want to make sure any questions about this? Yeah I mean I could I see you thinking of it. just out of curiosity like is there any intuition behind the design decision to put the plot above the code? That's interesting right like oh right I mean that's a setting. So to be clear that's a setting you can configure this.

Well, one thing that's kind of unique about MIMO and I'll let me explain that first. So, we're now going to go to p to part two because that's that's the bit where I can maybe explain that. So, these are three cells and like if you were doing stuff inside of Jupiter, let's say, right? Like you would run this cell, you would run the next one, you would run the next one like shift enter, you know that shortcut and you could then also maybe do something like I don't know $a - b + c$. You could have a cell like this. but the thing in MIMO is we can say, well, the order of the cells don't really matter.

And can I stop you for one second because you did something that is in on my mind. You have these like notebooks in like a continuous canvas or something. What is going on? Oh, I've got columns. Oh, you have columns? Yes. Okay. So, you can do that. Is that a So, that's like a MIMO thing. That's like a unique That's one of many MIMO things, but yes, that's a setting you can add in. So the I don't want to press the button now because the whole screen will move, but you can have like very wide cells or very thin cells. Some people like the the linear thing. I really like to have columns because then one column is typically like boilerplate setup and then the next column is like slightly more interesting stuff and then you know you can have levels of abstraction kind of logically, right? And but this also kind of falls into the category of well the order of cells doesn't necessarily matter.

I could move this into another column and the code would still run. And the reason why is because we do a little trick. So imagine that you're the notebook and you have a cell over here that says I want to calculate a minus b + c. Then I know that I need these variables and that means I got to start looking for cells that have those variables. And I'm just going to attach some names here. So this is cell one. This is cell two. Roman numerals. This is cell three, right? Four. What I could do is I could say, look, this is kind of like a DAG. I have cell four, and in order for that to run, I need this cell to be around. I need this other cell to be around, and I need this other cell to be around. And basically, before anything runs inside of a there's this pass over all the code where we try to figure out in what order the cells have to run. Because if we know it up front, then we can also do some clever things. We can say things like, oh, let's say the DAG was a bit more complex. Let's say there's a node over here as well, maybe another one over here. Then we could do things like, hey, if I make a change to this one cell over here, then these cells over here don't have to run again. We can kind of be a bit picky about that, and we can save some compute.

And one interesting consequence of this is that it's also fully reactive. So I can change this one cell over here, and then the rest can just automatically update without me manually having to run the cells. Now to be clear, you don't always want that because if we're dealing with a big compute thing like giant pytorch loop or big data frame operation, then you actually want to have manual control. So what you can do is at the bottom over here, we have this on cell change auto run. You can change that to become lazy.

And then if you were to make a change to a cell and maybe run that, then you can see the color of the cell changes to indicate that this cell needs to be manually fired off because a because it's dependent on a cell it just changed. And this way you can manually change all the cells if you want to. What does the on module change mean? On module change. Yeah. Oh. if I have like a Python file locally that's like you know a module that I'm building or like a package that I'm working on and I'm importing that inside of this notebook.

Okay. Watches the import. Yeah. Got it. The and then sometimes you want that, sometimes you don't. But we we basically give you control here. And the whole like the main use case I got to say for this really is the whole oh I have like a this one cell that's like a big heavy compute thing. I don't want that to automatically trigger all the time. And maybe for some workloads, it's actually a lot better to just do that stuff manually. That's mainly what the setting is for.

but one cheeky thing that's kind of interesting at this point, like if we understand that we we do this forward pass over all the cells and we try to figure out what order things have to run, there is this other thing that we could do. We could also introduce some UI elements. So I could say something like, oh, there's a slider here. So it's like starting value and let's steps a one something like that right I can introduce a slider so that thing can slide around and I can now say oh that value B over there that's equal to the value of that slider and now as I move the slider around we can also see that this value over here updates and if you squint your eyes you'll notice something over here change when I hover over you can see how long each cell took to run but as I move the slide around you can also kind of see the order of So when I trigger this cell, this cell will update. Afterwards, this cell will update. So this whole reactive thing is basically happening on your behalf.

And this is kind of special, right? Like the fact that these cells can run automatically. that is definitely not something that I was used to from the Jupyter way of thinking about notebooks, but this is if you think about what makes MIMO special, a lot of it really does boil down to this. The fact that we do this forward pass that we figure out the DAG. There's it's a kind of a nifty UI here. It's like explore dependencies and like there's lots of cells in this notebook so it's kind of big, right? But you actually have a map of like all the cells and what stuff depends on the cells and where we do the import. So you could also explore that if you wanted to.

I see. I have a lot of questions, but I don't want to this might actually so this might be a good time to ask them actually because I'm going to go into an example after. Okay. cuz I did saw you tweet this one time that there's a consequence that you're not allowed to do this. So you have some library mo HTML and you can't do this. And I I remember you tweeting about this, right? Yeah, that one that one caught me pretty but I think that's an okay compromise. I mean you know well there's there's a reason for it. Namely that this a is a global and that makes it easy for us to figure out like oh everything's kind of global. It's explicitly defined and therefore we can define the order of the cells. But there's al also like another thing that's that trips people. You also can't do this h because what's the value of a in this cell?

Do we have to assume that all of these updates happened or is this meant to be running after? So in place variable updates is something that we actually prefer you not do because it makes us makes it very hard for us to figure out what the order of the cells are. There is a benefit to this though and this is something that definitely bit me a few times inside of Jupiter. What would happen if I were to remove this a variable the declaration right? If I were now to run this cell an error is going to happen immediately because the representation of the cell has to also be equal to the representation in memory. And that's a thing with Jupiter that can catch a lot of people by surprise. If you accidentally delete a cell, it doesn't mean that the variable has been removed from memory.

If that makes sense. So, this is also a enforcement mechanism for consistency, if that makes sense. I I kind I kind of interrupted you because usually these two facts are the one thing that sort of confuse people the most. But like now that I've now I'm done talking, let it rip. What are your questions? Yeah, tell me more about the AI coding feature. Can it see all the cells? Can it see the markdown cells? Can it see everything? What does it see?

Does it see only the cells before it? Does it see after it? Can you tell us like more? Yeah. So, we we have all the

variables, right? So, these are defined. So, these are like variables. We we have them in sight. we also have these data sources. I've I've only gotten data frames here, but you can like hook up Postgress or iceberg or Red Shift. That one's new. that one was added last week. but data is like so we've got variables but then data frames or tables are kind of like special citizens. And one thing you can do is you can also chat with AI. So I could do something like hey what are the columns in I think I called it chick data frame.

Yeah. So it's an in-memory data frame. It can just detect that. and this gives us a way to say oh there's a data frame there. There's a schema attached to it. Let's add that to the prompt. And this is using cloud for sonnet. and you know it can see like it's able to inspect some of that schema information basically. And on our end what we do is we basically make the prompt a bit bigger. We're able to inject like some knowledge that might be useful. That's something that we can do here. like a couple of output things happen here. You can add that to the notebook or you can copy it. there is also a co-pilot feature you can turn on if you wanted to. and another thing that's also good to know, if you go to there's an AI section over here where you can add your keys and all that, but one thing you can also do is like add custom rules. And basically, I prefer polars over pandas these days. And whenever I make charts, I really like to do that with alter. And this is just going to be appended to every prompt that you send out to an LLM. And does the co-pilot in the notebook see all the cells in the markdown? Like if you wanted to just stay in the notebook and not go to chat, let's say, I I would have to do a little bit of a ring check.

Yeah. Okay. I don't feel like doing this right now. So I think the the tab completion thing that we've got that only looks in the current I don't know for sure actually. I don't know if the So we have two settings there. so one thing I could do is shift command E. There is this generate with AI element that we've got here and this one definitely works only on this one's cell I think but I could be wrong on that. I would have to check I need to check the the code for that to be honest. I do know for sure that this one actually looks at the entire notebook and you're able to explicitly pass on schemas.

Got it. I don't know for sure about the tab like this is like GitHub copilot tab completion stuff that you can get within a cell. I just don't know for sure if we how much we look outside of a cell. That's something I I prefer to be right than wrong, so I'm not going to answer that question. No worries. No worries. I understand. can you tell me more about the storage format of the MIMO notebook? Like how is it stored? And then it is a Python file. Okay. So, one benefit of having a Python file is the git story is just a kind of a bit nicer. Like it's a Python file, so you don't have to worry about the JSON stuff. Another thing is that you've got the cool UV benefits. So anything any benefit that happens to like normal Python files we also get. So you can add this I think it's like some it's a pep. So pip can also deal with this but you can add this basically to the start of your file. You can say what version of Python it needs and what dependencies we want. And this makes the notebook pretty much self-contained.

Like you can you can run this in a sandbox command. You do mimo run sandbox or mimo edit sandbox and it can just install the dependencies right on the fly. The thing that's interesting if you look at the cells you can actually see that this is a cell that needs a couple of variables and you can also see sometimes that a cell returns a variable and this is the basically the the reactive graph thing in action as well. So whenever you make an edit and

we save it, we have a decorated function where oh this cell needs polars around oh and this cell emits a chicken data frame and every time we decorate one of these functions we check like what's the input signature, what's the output signature and that way we can also construct the order in which all these functions have to run.

Another benefit of having it in a Python file like this is it's kind of like a fast API app, right? So we decorate everything and there's like we've also got SQL cells by the way a markdown cells and like we've we've got a lot of stuff but at the end you aren't able to do if name equals dunder domain app run. So you could also choose to run this notebook by saying look just python name of notebook file and it'll just run as a python script. So what you could theoretically do is you could like I don't know if you like I prefer typer but you can also define a click app in here and then your notebook can also have a self-contained command line application that is still in a Python file. So you can also use MIMO inside a CI if you really wanted to.

what happens to the outputs like let's say visualization something like that. Let's say you work on so we don't store them. That's the short story. We don't store them but what you can of course do is we do have you can download you can download this stuff as markdown or as HTML. So if you have static outputs that can definitely be nicely stored. Another thing you could also do is we have piodide nowadays. So what you could theoretically do is the outputs are still not store but you could also say well assuming you don't have any weird rust dependencies in here that pi can't handle you can also export this notebook to a static HTML file which you can then host on GitHub pages. So for lots of my new packages I basically host this notebook on GitHub pages and that can also be like an export target if you want. If you if you export a Marimo notebook to like let's say let's say you have a report that you made all kinds of visualizations and whatever you investigated some data you sent you want to send it to your colleagues you know just going to open up a a example. Do you have to export to HTML?

Is there any way to send them the notebook with everything in it without them having to rerun it to get the same visualizations? we I if I'm not mistaken, yeah, that is from the we need to run that from the command line. Like we have an export command. I think you could also let's just grab Oh, terminal. Yeah. UMO export. Let's just grab the help. Yeah. So, you can run it like HTML would kind of be the safe bet. It just dep if you want to export alter chart for example that'll be fine because you get everything that's just a static HTML file with some JavaScript and it's self-contained but if you need to run some Python code in order to also update the chart because you're connecting to some sort of API or whatever then you can hook it up to this WM back end but that's because you need some live Python to also run. You could also choose to export it to to a Jupyter file if you really wanted to. We also support the IPython notebook and then you can render that as you would normally too if you really wanted to do that. Okay. And can you go in the reverse direction like you can import no like can you import HTML into this like HTML notebook into MIMO or ipo or how do you how do you interchange I would have to double check. So we like the main thing with Jupiter that you have to be a little bit careful with, right?

it could theoretically be that you have a equals in like multiple cells and that's something we don't technically support. So you will always have that, right? So that's something to be kind of aware of. but in general the the main idea behind this format is we don't store the actual outputs. You can do that by doing some sort of an

export, but the main benefit of doing it this way is just the whole git story is just so much nicer. That's the I think the main reason why Ash the the creator went with this style. I could be wrong on the history details there but I think a is actually in the YouTube maybe as well so he can give details.

he's not in the zoom but yeah maybe he's in the YouTube. oh yeah Marrimo. Oh there you go. there's also a setting to automatically snapshot the notebook as IPython HTML as it runs. Actually, he's in the he's in the YouTube. Sorry, what did he say? There's options to There there's also a setting to automatically snapshot the notebook as you run. So, let's see if I can find that. So, there might be like a setting here, like a user setting.

When enabled, MIMO, here you go. when enabled, MIMO will periodically save this notebook in your selected format. HTML IPython notebook to a folder MIMO next to your notebook file. So if I select this and then hit save and if I then go here then yeah we see the bulk HTML appear. So this and this is the HTML that contains everything. So there there is a setting that allows you to as you are working. Oh, right. And then this is also an interesting thing.

I need to install this dependency in order to also store the IPython notebook. Let's just have that install. there's a packages tab. That's also kind of like good to mention. So you don't have to do the annoying exclamation point pip install package name thing. Like we've got a a dedicated sidebar that allows you to install packages. And also if I'm not mistaken if I were to do something like import sklearn or I don't know some other like torch if I were to do that right is that also around okay flask. Yeah whenever we see an import that isn't in the virtual environment we can automatically detect that and we can immediately add it to the virtual environment. So that's actually something that just happened.

Let's just save now. Double check the user settings. Okay it should now save this as an IPython notebook. The dependencies are now installed. And if I were to now check here, we see that bulk.ipb got saved. yeah, and I no renderer could be found for this mime type. I think that's a VS code thing, but the charts I do think would appear here if you were to add this to GitHub if I'm not mistaken. Could be wrong. but I would imagine that anything that you do get the marrimo slider stuff, it won't render of course, right? But I think if you were to add static map lip stuff here, it would be attached to the notebook.

I think we can open this open width and then we can say as a text. Yeah. So the outputs are stored here, right? So that's something you can see. So if you really if you really did want to store your like visual artifacts, you could but Mimo chooses to just kind of forgo that and have a clean Python file instead. That's the main vibe at least that I would describe it.

Okay, great. Yeah, it was really helpful to get that like it is different. So the main thing is it is different than Jupiter, but for me at least the main thing that kind of took me by surprise is the fact that like oh it's the reactive nature and things can automatically run and that has consequences but the moment that you grock that you can kind of infer how everything else is supposed to run but it is very much unlike Jupiter. if I were to like from my experience, the main thing that I miss from Jupiter that I did think was kind of neat is you know how you can be inside of a cell and outside of it.

those shortcuts just kind of work differently because there's not really a notion of being inside of a cell or outside of it. A good consequence of that is that I do get these columns but because we don't necessarily have like a first cell and a last cell because it's all kind of a DAG. That's also why a lot of these keyboard shortcuts that you're used to that's also going to be just fairly different. Like that's the main that's the first half hour. oh my my fingers don't find the right shortcuts anymore. That's the main pain point that I experienced when I tried it the first time. What do you mean? I'm not sure I track the inside. I mean I understand you're inside a cell and outside a cell, but would I'm not sure. It seems like you're inside a cell right now. You're inside that first cell. Oh yeah. Yeah. But there but usually So if this were Jupiter, right, I could hit escape and then I'd be kind of outside of a cell.

Yeah. And then you will be able to go through all the different cells. Let me put it this way. That was a shortcut that I used all over the place back when I used Jupiter for like quick navigation basically. one thing we also have a command pallet. So like one thing you could do is you could go for like show the keyboard shortcuts and then like all these shortcuts are things that you can also manually change but these shortcuts are like pretty different from Jupiter basically because the way that cells interact is also very different from Jupiter. So this is this is the main sort of productivity hump to get over I might say. Okay.

So okay having said all of this like I've exper like the the reason that you personally like Mimo is there a certain feature that kind of you know takes up most of your I mean is is there a certain like flagship feature? Is it the reactivity or is it just like a whole bunch of them together? It is. It is definitely the So you've got these reasons that pull you in and then there's like the holistic picture that makes you stay. That's kind of the way that I would experience it.

So for me, the AI thing on its own would not be a reason for me to start using MIMO. The way it does package management on its own would also not be the reason for me to use MIMO. the UI elements also for me, they're they're interesting reasons for me to try them, but it's not for me to stick around. However, when you add all of them together and when it's kind of becomes a holistic ball, then suddenly I become super duper productive. And I think the main moment for me at my previous employer, I was doing a live stream and I hit a bug during the live stream that was caused by I deleted a variable that was kept in memory. I had a cell that still had that variable around, but it wasn't representative of what was in memory.

Like something along those lines. That will just never happen in Maro. like there will be a big red error in my face whenever a moment like that would occur. So like there was this one time when Mimo actually corrected me live and that was a moment for me where I did start to think like okay that this is nice like I like tools that correct me while I'm in the flow of it and not like five minutes after when I'm trying to debug something.

That makes sense. I can see already for teaching is kind of interesting already. Really I mean the column thing is really good. Yes. for for for this like what you're doing right now which is like teaching us and let me give you another thing that's great for teaching then since I have you but before getting there I'm going to have to explain a little bit of theory because I'm about to show you like a pretty complex visualization with like a couple of steps in it. It's a trick that I've used over and over again in the past but let's say you've got a big data set. This is a

picture of a database and we have lots of texts in there and let's for for keeping things simple let's say that this is a customer support data right it could be that we are interested in a very specific phenomenon maybe we're interested in things like oh customers might be complaining about deliveries or something like that right and one thing I could do is I could type the word delivery and I could do like a basic text search and that wouldn't be a bad idea, but there's a lot of these like delivery adjacent words and things, right? So instead, what you might want to do is maybe do something with vectors instead.

So one thing you could do is you could kind of build the very standard vector lookup thing. You take every single text, turn that into an n-dimensional vector, and then you could sort of do the lookup. But the thing that I usually really like to do instead is I like to turn that highdimensional array into like a lowdimensional array, preferably two-dimensional. And then I like to turn that into like one of these big scatter charts with basically it's a trick I think people have seen before, right? If you take lots of these texts that have clusters in them, if you pass them through UAP after doing some sort of a embedding, then you tend to get this 2D chart where there's just lots and lots of different clusters basically. And if I'm done then like one thing that can happen just to clarify UMAP is a clustering algorithm. It's a dimensionality reduction technique. It is oh dimensionality reduction. Okay.

It's been a while since yeah so it's the main thing to think about it the main way that I like to think about it is PCA is really good at keeping the global structure intact but that does come at the cost of local structure. Like it's kind of hard to find clusters when you do PCA. But then what UMAP does is it basically says, "Oh, but all the clusters that were there in the highdimensional space, they persist in the low dimensional space. It's just that distance between clusters no longer means anything."

That's kind of the the balance if I were to put it into words. But the thing that I'm about to show you is I'm about to show you a system where I can type a query and that is going to determine the colors that appear in this chart. And that I'm going to show you how that will just help me find data points that I'm interested in maybe annotating. And this is also like a perfect example of something that would be super hard to do if we didn't have something that was like properly reactive. So like one thing I could do is like this is the the altter chart that's decorated. And now this looks so familiar now. I feel like you've been working on this derivative of this specific thing for a while. Even before MIMO, I've seen you hack around in this area. So I I actually So I spent years building like standalone web apps and like Jupiter plugins even to get this workflow to work nicely for me because it's a very powerful workflow like you solve a lot of problems if you do it this way. But if you have reactivity, it's just done. So what MIMO can do is it can if I just show the code, it's kind of a cool trick. So you can give it a scatter chart from Altter and MIMO can turn that into a selector widget. What does that mean? Well, what I'm able to do is I'm able to make like a selection here like I'm able to select these data points and then this widget has a value property and I can just look at what I just selected basically. And maybe I should zoom out to really show that I can select a different region here and then the data frame down below here updates.

So, what I'm actually able to do is like kind of look around this embedded space. something over here. What's this? This is all about online grocery items. Stuff I see over here is about club cards. So, there's like clusters over here, right? And the fact that I'm able to make a selection and get an impression of what the cluster is about,

that's definitely kind of nice and useful. But what I can also do is say something like, oh, I'm interested in like, I don't know, club card.

And when this cell updates, this cell can update, which means I can now make a selection. And lo and behold, this cell can now also update. But there's something about that interactivity where is it stacking that filter kind of like like you have that query. So this is just to change the color of the dots. The only thing that this does. I see. But the reason why I do that, there's a good reason for it is sometimes two clusters light up at the same time. And that's interesting. Like again, I don't want to stare at my data.

I want to interact with it. I want to actually look at it. I want to understand what clusters exist. And there's an interesting thing like you have club cards. But if I were to go to like delivery, that's also a common theme. Oh, that's a that's a lot bigger. For example, just like being able to spot that and see that, oh, there's actually way more complaints about like deliveries than about like club cards. just doing a basic vector lookup and then looking at some of those results wouldn't give you this extra information, right?

And it's super easy for me to just whip this together inside of a maro notebook. So, there's a ton of these like visual packages that I've made that I'm just not going to be maintaining going forward because that'll just become a widget inside of a Maro notebook and we don't need the complex web app around that anymore. And again, why does that work? Well, we have reactivity. Nice. So that's like that feeling like it's not necessarily upgrading the notebook. I'm kind of more upgrading my imagination. That's the thing that's making me stick. Like I kind of know that I can get quite creative with the stuff that I want to do and again it's just nice and reactive and it's just super nice.

Any questions about this before I move? Can you can you scroll down a little bit? I just want to remind myself how you Okay. So you have the plot because you have an alter plot. Yeah. So, so going through the steps, step one is query goes in. Then I've got an alter chart over here. The colors update. Then I can make a selection over here and whenever I make a selection this data like the widget that I declare here that has a value property that's a data frame and there's a text column that's what you see over here. So the only so the step is change the color make a selection. I can I can also pan around by the way I can make different selections. But every time I make a selection over here basically this other cell will update as a reaction.

Can you show that part where you link the alter chart to the you know so it's it's really this. So this is the alter chart. There is this little magic thing that we have around that. So there's a couple of libraries. alter is one. We also do the same thing for plotly. you give it an altar chart and altar has this selector element but it never really had a way to give that back to Python. So what Mimo is able to do is it is able to say like look this is still an alter chart but you're also able to make selections and when you do we have a widget over here that widget has a property called value so widget dot value and that is just this one data frame and that's basically just selecting the data this is just a subset of the like the subset of the entire data frame that's what's being selected and that's something I have over here as a ver as a value but this cell knows if I want to display this this widget is a thing that I So then this cell goes I have declared widget but then this cell says but if I want to be able to declare widget I need to have this variable plotter. And then I think I've got a cell somewhere I don't know where maybe down

below over here. Yeah plotter. And if I want to have plotter what do I need? Well you are going to want to have this transformed X thing. And eventually it says oh I need this query over here.

So now that's interesting. Did you run that cell that was all the way down there or does that matter? Like what? It it runs automatically. So it I don't have to worry about that. That's the whole that's the whole point of MIMO. Looks at the variables in the cells and just by looking at that it can kind of it doesn't do this at runtime. It does it before running all the code. But the whole point really is oh u I know what variables this cell needs.

Let's look for the parent. Let's keep on looking for the parent. Okay, we've mapped everything. Okay, now we can run everything once. Oh, a cell over here changes. Okay, what children do I got to update? That that is all handled for you. Okay, cuz like in a Jupyter notebook, you would Yeah, you definitely would have to you would have to scroll up and down, run a few cells. I I've been told there is actually a plugin nowadays that can do some of that stuff. And if you build your own widgets with the IPython widget library, there is actually like there's a couple of party tricks you can definitely do. but this is just so much more intuitive.

Like this is a I don't have to think about it kind of a feeling. And I see you've nerd sniped a lot of people already with this fast HTML. I'm not going to spoil it, but I see that you are teasing it in the next column. oh, people have spotted that, have they? we'll we'll get to that. Okay. I'm talking to you. I'm I'm assuming the fast HTML card is going to show up. I better come prepared, right? like do the homework. but anyway, like this on its own is kind of a cool demo.

Like already I like to think like okay this is pretty useful. This is also good for qualitatively understanding what this data set is about basically right that's cool but why stop here like if I were to now think like what's actually useful to do like let's say okay we we know that we are interested in getting some complaints about deliveries. if I make this selection, sure, some of them are going to be about deliveries, but some of them won't be. But these examples over here are like quite approximate to examples that are about deliveries maybe, right? It kind of feels like we got to do some annotation here. If you want to turn this into a classification problem or something like that, right? Then maybe a good next step will be just labeling.

That's where this little guy is going to come in immediately because there is a standard nowadays and it's a really cool project. It's called any widget. any widget solves the problem of building a widget that will work in Jupiter and in collab and in MIMO and like all those different notebook environments. And any widget is just kind of the standard that everyone else can wrap around. And this is a thing that allows you to make a widget basically. So, Jupiter also has like a widget library. and the way that Jupiter handles it was always a little bit different than Collab, which is always a bit different than VS Code. The whole point of this library is that there's one standard that everyone can kind of just adhere to. It has a small service area, but what it does allow you to do is build custom widgets for yourself inside of your notebook. And who maintains is this a MIMO project or is it a third party or what's the background of it? There's this guy called Trevor. If you I used to host a podcast for my previous employer.

Trevor was the first guest. Trevor Mance, he did a PhD kind of evolving around widgets like this. a bit more in

the biomedical space. if I recall correctly, he is a direct colleague of mine, but it deserves to be stressed. any widget is like all notebooks and that's not going to change. So yes, Trevor is working with me and my colleagues and we're definitely eager to invest in any widget, but any widget itself will never be MIMO specific. This is across all the notebooks basically.

So if you build an any widget for MIMO, it should also work in Jupiter. That's the way to think about it. However, the the one thing I do want to mention is that the reactive nature of MIMO really lends itself well for any widgets as you might be able to imagine because what these widgets are able to do is you're actually able to change something on the JavaScript side of things and then see that reflected in your notebook. And maybe the best example of that I'm just gonna maybe do something down below over here. This wasn't part of the original demo, but I might as well show it. I made this any widget library called draw data. So, from draw data, I'm going to import a scatter widget. Let's just zoom in a smidge.

yeah. And then draw data needs to be installed. So, let's install that. It's installed. Good. And now I should be able to do scatter widget. wrap that with the MIMO any widget wrapper. And then this is a scatter thing. And then I should be able to just show you what the scatter widget looks so this is a tool that allows you to literally draw a data set. And this is amazing for teaching because you can literally draw a data set as you see fit. And the cool thing with that scatter widget is you can actually data as pandas if I recall correctly.

Yeah. So it can come out as a pandas data frame. And every time I draw more rows are being added to the data frame. So that's super neat. But what you're seeing here is I'm I'm doing something in JavaScript land and somehow that finds its way back into Python. So did you define this widget with Python or JavaScript? Both. Okay. So if you look at the any widget example on the main docs, I think it does a really good it does a good job of explaining it, but let me just can I zoom in? Yeah, this zoom in and change the color. Notice by the way that I'm doing the doodling thing again. Everyone buy the drawing tablet. It is amazing. So this is how you would define an any widget.

you have to import these two libraries. One of them is called any widget. The other one is called traitlets. Traitlets can be seen as a library that is able to bind variables such that JavaScript and Python can sort of communicate. and then there's this one value that I attached to this object. And then this is the basically ESM JavaScript string that has this one function called render. It needs to accept a model. The model represents all the variables that you declare from Python and that are shared between the JavaScript side of things in Python. And this element is basically the DOM element that it needs to attach onto. So in order to write these, you are going to benefit a lot from being able to do a bit of JavaScript. But what you can also do is have someone like Vincent who actually doesn't mind writing JavaScript. and I will build these widgets for you such that you can just use Python inside of a notebook that you like and you can still benefit from like having this interactivity as part of your workflow basically.

But the way it works it's not it's actually not that intimidating. So if I just go over like all the things that I that are listed here, right? So okay, what's the first thing that happens inside of the JavaScript thing? Well, we declare a function where we're able to get the value which is this trait lit that we've defined inside of Python. After that,

we're going to create a button element. we're going to say, "Hey, there's a count attached there.

We're going to add an event afterwards. like whenever we do something in JavaScript, that's what this event here does." But we also have something clever here where we say like, "Oh, if ever the value changes from the Python side, this is how the JavaScript should respond." And that's about it. So, it's basically what should happen if JavaScript makes a change to Python, what should happen if Python makes a change for JavaScript, and then you've got a button that has state. and that's the way it works.

Cool. U any widget is the bee's knees again just like the drawing tablet. I don't understand why I'm the only guy making these widgets. There's a small crowd of people actually building these widgets. It's a cool Discord, by the way. Like do definitely join. And does it only work is it only appropriate for you know notebooks or can it can you put it in your web app in just the same way or it's no. So, I've I mean Trevor would know the fine details there, but it's a different interop basically.

because Jupiter has like a certain way that it expects variables to just kind of be there and it's I've not tried getting it to work inside of a proper web app. like I'm 99% certain it's going to be a painful journey and it's going to be way easier to just use something like fast HTML instead if you want to have this kind of interactivity unlike a normal website. But the goal here really is to give you features for your notebook experience also. So it's kind of it's not the target I think for the project. Again, if Trevor is watching, he can confirm. but u my impression is that this is really just meant as a tool for you to build tools inside of your notebook. Fun fact though, there are actually a couple of very popular libraries that actually use this under the hood now. And if you go to the community tab, Altair actually uses this under the hood, which is like a thing that not everyone knows about. there are also these other libraries, more to do with like mosaic. there's also some like physics things in here, by the way.

but there are like pi opsplot is also like a really cool plotting library, by the way. But there's like a small community and there's definitely like very cool widgets for sure. But it's kind of one of these libraries that are meant for package makers. So it's not that wildly known amongst the user group if that makes sense. Yeah. But it is a super cool project and if you're interested in learning JavaScript, this is probably the most fun you'll get like building your own widgets. if people are interested in talking to me afterwards, I am actually doing a bit of prompt engineering right now to see if we can get these widgets automatically generated on the fly. like you the dream that I've got is that in a couple of months you'll be able to go into MIMO right and you'll be able to sort of start typing here something like hey build me this widget because I want to do this kind of research and the widget will just be generated for you inside of the notebook. So what's the what's the devx of that widget building experience since you are writing JavaScript inside a string like oh you can also have it you can also have it in a file and then you can have and you can just say like hey there's a static folder here Python path library open that file put the string in here that you can also do. Is it a nice way to debug and let's say kind of play with it like really quickly when you're writing the JavaScript, you know? I mean, the main to me it all became easier when I learned of this one shortcut, shift command C, because what you're able to do is you're able to click an element, click, and then DevTools will immediately bring you to that one element that you're interested in debugging.

like it's the the annoying thing was figuring out like how do I select that one element inside of a Jupyter notebook and I don't want to click around here forever. That that used to be the painful bit, but then once I got that figured out, it was pretty good. I will say you can also get quite far with vibe coding those kinds of things. It's just that if you want to debug it, it does help if you've done like D3 before, let's say. Oh my goodness. D3. Okay.

Yeah, I know. I like I like that. That one is a steep learning curve. Yes, it is. But at the same time, it was also the reason that I started to learn programming. Without that library, I probably would never picked it up. Yeah, it is super cool. No doubt. Yeah. so the but like one observation I do want to maybe make here is like, hey, this is kind of interesting. Like when we're talking about interactivity, MIMO comes with widgets, but nothing is stopping you from making your own. And the way that I've set up this notebook is what I can do is I can actually maybe make a selection over here. This is something that I might want to annotate.

And then here we are to the widget that I sort of want to really highlight here. this is an annotation widget. There are lots of ways to annotate data. sometimes you want to make selections in an image. Sometimes you want to make selections for spans and text. Like there's lots of different ways to do it, but nine times out of 10 you can boil it down to yes, no, and skip. like it's kind of a binary situation that you can often boil it down to because sometimes it's a classification. Can I can I apply this label? Yes. No. Sometimes it's oh, there's these two variations. Which ones do I like best? sometimes it's oh, I'm doing retrieval. Is this example a good thing that fits this query? Like so the way that this thing is set up is basically you have to generate a a card here in the middle and then you can say yes, no, or skip. And you can also go back if you wanted to. The way that you generate this is up to you. The only thing you got to do is give me a string that really looks like it's HTML that I can render in here. So, if you want to use fast HTML for that, totally be my guest. But the thing you got to do is you got to give it a list of examples and a function that knows how to render each example in here.

Then I can render that in the middle and the widget around it will from there provide you keyboard shortcuts which will also be displayed. And I've also built it in such a way that the gamepad API is also supported. And the thing that I'm then able to do is I'm able to sort of click around and say like yes, no, yes, no. I'm able to go back as well. But the really cool thing is sometimes you also want to add context.

And if you're using Chrome, Chrome has a web API for speech detection and it's free. So what I'm also able to do is hit this button and then I can start talking and then oh this is now a note that will be attached this one annotation and I'm done talking now and I can go to maybe next and if I were to go previous I can see the note again and I can sort of there's lots of these examples I can imag like especially in LLM land where oh the bot made a mistake here but for downstream tasks I got to explain why this is a specific kind of mistake right so for that use case I also make it easy for you to just add a note if you look at the annotations at the bottom here. So, can I ask you a question about this annotation interface? what part of this annotation widget, this card, I guess, with the buttons like is that all defined in fast HTML or what up to you in this demo? What was the render render? This render function. So, this render function is fast HTML. So, I wrote kind of my own thing called no HTML. It does a few things that I like.

but any like you can also use Ginga. I don't really care. I will say fast HTML does lend itself very nicely for this though. But you have an example that goes in and what I want to render is some sort of span on top that tells the user what the label is, what the task is basically. And then at the bottom I have this example text that I just want to show. And there's like a couple of Tailwind classes that I attach. But the way that you render this, it has to be a function and it's up to you to choose what you like.

But fast HTML does lend itself very nicely for this, especially because I think Isaac is in here. He made monster UI and there's like a couple of these packages that come with nice UI elements. Those can just be dunked in here and they just work. You scroll up again. I'm trying to just locate where this label appropriate thing is and the other text. Sure. In the UI. Yeah. So, so let's let's first start here. So, we've got those examples, right? Yeah. Yeah. And let me let me maybe start there. And again, let's just look at the first. Oh, I see it now.

It's part of that. Okay, I see it's underlined and it has the But so, okay, that that text part is basically your that's the renderer and then all the buttons and stuff are kind of your widget that you already made that we plug into. Yeah. So, so the thing I I well the thing that I've built around it is Whoops. The thing I built around it is this progress bar, these buttons, the notes thing at the bottom, and it's up to you to populate this with something meaningful. I see.

And and how do we do that? Well, you supply a function that can do it. And as far as I'm concerned, fast HTML lends itself quite well for that. I really like this. This is like a really good trade-off or this is like a kind of a good design pattern. This is I think you would have to be really annotating a lot of data to know but I I think this is I've built annotation software before so it's not my first forego edit but the main thing that I like all the things that you just said are true but there's like this one extra thing I want to add here you can still do Python around it so if you want to do dduplication up front send it to a specific database do user stuff you're in a notebook and you're free to do whatever That's the thing that I really like about this approach mostly. Like sure, the UI is kind of like nice and all that and the game pad is awesome, but the main thing that's really nice is it doesn't get in the way. You just add a widget to your notebook and oh, it's pretty fun to just get started annotating and you can be done in 10 minutes and in an hour you have 500 examples. I don't know how fast people like to annotate, but it doesn't break your flow. That's the main thing I like about this thing. You don't have to start up a new app. You can just sort of add a widget and your notebook can now also annotate data.

at people staring at their data and started a very nice balance. the thing I made earlier by the way like this is this is I think a widget that combines a few elements. the speech to text thing there's also a library called Mo talk that just has a widget that only does speech to text. There's this other widget called mopad that is doing the gamepad stuff. like there's also widgets just for that, but don't sleep on these widgets in general. Like other things that you could do, I don't know if people played around with the Gemini API, but the Gemini API actually allows for drawings and like images and stuff. So, I made this paint widget, but this paint widget is actually like pretty dang neat. Like if you want to demo that I've done that you can do yourself as well especially if you have a drawing tablet like this you can actually draw a DAG like this and then tell Gemini like hey what's the JSON for this and it will just go ahead and give it to you. I'm building another tool like this built on TL draw which has like proper vector images and you can draw proper diagrams in that and then hand it off to Gemini and they can actually do

mechanical engineering tasks for you.

And again like why stop there? we can paint, but what we can also do if you're into like PyTorch and stuff, I can also come up with widgets for like charts that live update. So, I can have a cell over here that has a chart and I can have another cell that updates that chart in line because I can change the state of the widget. And that's something you can now totally also have in your notebook. You can have these cells that sort of asynchronously update as while some training is happening.

And on top of that, and that's kind of I think a nice place to maybe end as well. hey, one question, those annotations, how do you save them? Do you like do you do that? Yeah. Like where do you So up to you. So like one thing, as I annotate, right, this cell over here updates and there's a list of items. You can write some logic here that says every time I don't know I get like I have like 10 annotations or maybe 20 and then 30 etc.

then I'm going to send the request to some back end to store it in a server. you can also write a little bit of SQL alchemy here if you really wanted to. That's kind of up to you. You can sort it into a file as well. It depends on the that sort of stuff usually depends on what you like to do as a team but you can write Python around that to take care of it. Okay. It's this label widget get annotations when what is the event that triggers that to run. So this thing triggers every every time you make an annotation. So you could store every single thing that goes in. You can also choose to batch this.

Okay. And you can Yeah. So you can do something like if length of this thing mod 10, right? then the cell will still run every single time, but it's not going to cause an event to happen downstream if you were to like add a mod here. Like you can do stuff like this, but again like this is like I remember working at this company and then the community would ask us things like oh could you add support for MongoDB and like oh could you add support for Postgress and oh could you add support for Unicorn DB and like you we kind of get like all these crazy requests of things you would like to add. So the main thing that I would recommend people do here is just write Python. You can figure out. So is there something like get annotation but singular like get and like you know just gives you thatation just most the most recent one you mean?

Yeah. You would just do it like this. Okay. I mean I made this thing like two days ago so it's pretty fresh. You can definitely like use it for a bit and then tell Vincent to maybe consider a feature. Right. That's also something that can happen. Like the main thing I want to do here is like this is also me presenting this for the first time to the outside world. I'm also here eager to get feedback, right? So like if there's a preference to maybe only have the latest thing or like something like that, we can always add that to the library. That's that that's definitely reasonable.

Got it. Okay. I mean this is like isn't like okay this is not you saying this is our annotations or like our widgets library that we've you know thought about for extremely long time. This is like, hey, you can build whatever you want in MIMO and kind of look look what I built. You built this thing for annotations and you can build something too if you want. Yeah. I mean, it's kind of like Legos. That's the best explanation I would maybe put here. MIMO defines how things can click together. And what I really like to do is come up with fancy new Lego

bricks that you can maybe use, right? and a lot of it is because, oh, there's a new Gemini API. Oh, it does stuff with images. Oh, I need an image input. Oh, it doesn't exist yet.

Okay, let's build one. so a lot of the stuff that I do, like I'm I'm I'm technically the first hireer over at Mimo. So I am technically like a developer, although a lot of stuff that I do is a bit more based around growth. And the way that I like to maybe do that is I also do the YouTube thing of course, but a lot of it is also just come up with widgets to see if this can actually serve a community. So right now I'm very much into the, you know, data quality. That's definitely like my background. I want to make sure we got good widgets for that. depending on what we got to focus on this summer. I don't know, maybe we do some stuff for maps, right? Like I can definitely see that kind of becoming a nice little thing to maybe work on. so we'll see like what has priority. We're we're a small team, but we ship like three releases a week. four if you include these widgets.

but the thing that I'm trying to do is have like more widgets out there in the ecosystem. That's definitely kind of like the thing I really try to do over at MIMO, which is also like every month I tend to release two of these widgets. Okay. there's been a lot of comments on the Zoom that you have a YouTube channel where you keep sharing different ways of using MIMO and it's highly recommended. So, it gets compliments online and we are not we we try to get we try to if we make a video, we try to not be too hyp about it and make it worth your time. We only try to show stuff that's actually kind of useful. That's definitely a goal that we have in mind. But yes, definitely check us out. we also have a really good Discord by the way. Feel free to check that out as well. I do want to end on like a final thing.

because that's something that people sometimes forget like a thing that you can also do just as a programmer, right? let's make a a class like I don't know foobar, I don't know. And we're going to initialize it just like you would normally, right? And I don't know, you would do like self thing equals thing. Let's maybe add a thing in here. Fine. And then if I were to do something like fubar, this is what the representation looks like. And this comes from the era where we are doing things inside of a terminal. And that's fine. But for Pete's sakes, we're in a browser. We can do super awesome things in here. Like what one thing you could do is maybe consider doing some interactive HTML there. So like one trick that you can do that's marma specific is you can add this display method, right? And then I made this one library called Mo HTML. Like one thing that's kind of cool about is you're able to do like you can add some text in here.

Hello. I could do like a class font bold if I'm not mistaken. Right. If I were now to run this, oh, like I can display a rich HTML thing in here that kind of belongs nicely to this class. And the best example, there's also the dunder. Yeah. HTML thing. And you know, yeah. So there's this repper HTML is also something that exists. Yeah. this will work across Jupiter and MIMO. The only thing like the reason I bring the display up is because this is Mimo specific, but Jupiter does not look for this one, but we do. So if you want to make something as marimo specific, this is the way to do it. this is also definitely something that you could do though. So if I were to Why would you want to make something maro specific? Like what's an example?

so one thing that we've got so mo app meta and then mode, right? So this is some so right now I have code that I can write that detects that right now this app is running in edit mode, right? But I can also run in app mode like

I can drag I need to zoom out here but I can drag the outputs of cells into a dashboard if that makes sense. And this in doing this this is like the the widget editor that memor gives you so you can make these boxes smaller or bigger but now you're running in app mode. Oh maybe the way that you display something needs to be different if you're running it from edit mode or app mode let's say. Okay, that that distinction is like a very MIMO specific thing, right? And and there will always be things that are just really MIMO specific. So for that, we have our own little verb, but it should be stressed.

like nine times out of 10, I would already be super happy if more people would just do this. Yeah. Yeah, it makes sense. You're in a browser like do it. Do something cool with it. Because if you do that, then you can, I don't know, maybe make a dice library where, oh, I have a dice with eight sides and it just looks like a chart with all the probability values that are in there. And what's kind of cute then is if you were to maybe add, you can add two dice together, hook up a slider to it, and this is just your your Python code just becomes so much more visual, right?

And it kind of feels like more people should maybe get that as well. Like this is this is also like something I would love to see more libraries do more of like think more in terms of like hey we're building tools for a notebook can you tell us a little bit more app about app mode like oh sure is that can you how far can you go with that like in the sense can you deploy basically web applications this way do you see people putting in front of it and stuff you know how does it what so we Well, so like there is a demo on our GitHub where there's a fast API app in front of this and then fast API handles the off for you. the because MIMO is built on top of Starlet. So like if you really want to do a proper integration, it helps if you're building something that's like Starlet compatible.

I will say there's like a few ways to deploy things inside of Maro. So one way you could do it is you could say, "Oh, let's deploy this to Wom, right?" And then you can put O in front of that. Another thing that you could also do is say, "No, let's deploy on like a proper Python back end because we need like GPU support or what have you, right?" if you want to take a notebook and run it in edit mode, you would call from the command line MIMOedit notebook file. If you wanted to do something like, oh, actually run it as a web app, you would do MIMO run instead.

So, that's the that's the main like from the developer experience, that's the main distinction. Okay. Yeah, it looks really cool. I need to give it another go. This is like a a really targeted way to snipe me into Mimo that you have come up with right now. Trust me when I say it wasn't just you that got nerd sniped by the game pad by the way. but like I'm also just still kind of scratching the surface of what you can do with me remotes. like we honestly we are really good at making releases to the extent that like a lot of our team members don't always know about all the features just because we ship so much stuff. That's actually we had a small little meeting about that the other day. definitely expect us to keep on adding features. you can also definitely expect us to build something cool over the summer and that we're probably hopefully going to announce in September. So that's also something to look forward to. But the main thing that I really hope to get across here these are all just tools, right? But please like expand like it's we're not upgrading a notebook here. We're trying to upgrade your imagination as well. So if you take anything away from this, it's really not so much like use Mimo, use Mimo. It's

it's really cool. Like use it. But I want people to dream a little bit more.

Like that's that's more kind of the point. especially because we're like pretty soon we might be able to generate these widgets by talking to an LLM, right? And that might become a really big part of the future of how you work in a notebook. But in order to get there, I do need people to sort of let the idea of what the old way of working in a notebook was, I need I needed to have people to let that go a little bit because what Brett precisely what Brett Brett Victor said in that great talk.

we don't really know what the future's going to be yet. So, we're going to try a whole bunch of stuff and we can be really creative, but only if we allow ourselves to be, right? So, that's the main sort of Yeah. No, that's great. That's end on Brett Victor. Can't go wrong. can you tell me a little bit before we go? how does Mimo make money? Like can we, you know, is there a paid aspect? some kind of hosted version something. How does it how does it go? So there's nothing I can let me put it this way.

I can't announce anything on that front just yet. But one thing I can say is historically there was it was two people before and they got a grant which allowed them to work for like I think a good year and a half on MIMO. then at some point the choice was made to go with the VC route. So this is seed funding that we're at. it was a round led by some pretty big chiefs. Anthony from Kaggle if was in there. I think Wes McKinnon there like big of big group of old school CTOs that wanted to do a seed round. So we're in that. The focus right now within the group is definitely like let's just make open source really really good and let's see if we can get like a good community around it. That's the like I would argue primary goal. You can definitely imagine there's going to be at some point a version of MIMO that does some enterprisy stuff as well. and that's something that will definitely be explored. But what you're seeing right here and right now, this is I believe MIT licensed. It's on GitHub.

This is not going to go away any anytime soon. Like we're not going to do a rock pole on something that's open source right now. That's not going to happen. All right. Sounds great. this is really great. I will you know visit if you don't mind sharing the notebook or GitHub wherever it's located if you if you go to the okay go yeah so if you go to coning/mo label yeah so you can actually play with this thing on GitHub pages because it is Wom compatible but the notebook that I'm using right now bulk.py Pi is on the GitHub repo itself. The data sets that you need are also self-contained in there. Okay. Mo label.

All the all the plugins that I make on beha that are kind of like MIMO related, they all start with MO. So there's Mo HTML, there's Mopad, MO talk, Mo Paint, Mo label. Nice. All right. Well, thank you so much for coming. I will post notes with all these links including you know the drawing pad and all everyone had wants to know what everyone just wants the link they just want to buy it so I will figure it out and I will mo paint mo paint you can go to the you can also go here and immediately play it with mo paint it is it's going to load it's going to work from GitHub action oh what I mean is the drawing the your your hardware oh that thing yeah okay this there's a calm code okay so if you go to calm code.io io. You scroll all the way at the bottom and then there's this meta category and there's content that is basically a small course that I made five years ago. All of it is pretty relevant still just a different drawing tablet. oh that's your that's your website com code. It's one of them.

I have a few at this point but like com code is a learning thing I made over co it is probably the cheapest data camp alternative you will ever see. It has like 106 courses about all sorts of Python and data topics. If people want to know more about like stuff that I do like day-to-day, I also have a blog as well as a a Substack if people are interested. and I guess like the final like there's two things. Yeah, a couple of personal plugs actually. I have a personal YouTube channel where I tend to review these ergonomic keyboards. the one thing I want to say to that is the ergonomic keyboard doesn't fix everything. but I've met a couple of people that really ruined their wrists in their career. And I'm super happy that I'm not one of them. I was early enough. do take that stuff serious. And if you want to have honest reviews, definitely go here. But if you ever feel like wrist pain, take that serious. Do exercises, talk to a physiotherapist. Don't ignore it. It could risk a career. Like that. That is a thing I do want to maybe mention explicitly. yeah, I know people like that for sure. Yeah. And you just want to prevent it. there's a couple of really good boards that help you do that. This is one of them. But pull reviews can be found over here. And then a final thing in this age of like LLMs and stuff, I'm also interested in writing software that's just a little bit more human. And this is more like personal project territory. And this is more like I'm sure some people find this interesting, but one thing I made a while ago is this service called Dear Me email. The way it works is you can send yourself an email and you get it back in 30 days and that's it. It's kind of like a way to reflect if that makes sense.

I made this a while ago. I I gave it a little boost now because I want to sort of get back into this human software a bit more. I know of at least one guy that was dealing with alcoholism that ended up sending himself emails and it actually ended up helping a whole lot because it's really hard to be critical against yourself. Like if you yourself are reminding yourself of like goals that you've set and you're failing, something about that is really impactful. So, if that sounds interesting, definitely come talk to me about that as well. And another thing I'm currently working on, I've noticed that it's very tempting to keep on asking chat GPT for things to the extent that like I actually want to know things myself as well, like from the top of my mind. So I'm also exploring like a variation of Anki that's just you know live and it's free and it's out there. next week I'm also going to add gamepad support for this. but I'm definitely interested also like from the point of view from a of a developer.

It's really great that we have these LLMs at our disposal, but I would hate it if you become so dependent on it that at some point it becomes kind of a learned helplessness kind of a thing. So, if people are interested in maybe exploring that with me as well, definitely reach out to me on socials too. These these are like side projects. Does this does this like project potentially pull from your existing conversation history to find repeated things or something or where you I might go there. I might go there. For now though, I just the thing I want to focus on now is just that oh, if you're on the bus, the mobile experience is just nice and oh, if you want to use a game pad, that is just kind of nice. Step two would be how do you generate these flash cards to start with? But part of me is also wondering like maybe the act of building the flash cards yourself and being very conscious about that is also good for like deliberate practice if that makes sense. So, I'm I'm definitely eager to explore the LLM generates flashc card thing later, but for now, I just want to iron out lots of other things. It's more like, hey, do other people also have this feeling of I'm becoming too dependent on these LLMs. Would it be good to maybe invest in a few apps like this? If people are interested in that, then definitely also reach out to me because that's like definitely territory that I'm personally exploring right now. Okay. Yeah, we should talk you should also talk to Isaac. Isaac and I work with a company called I Okay. Yeah, remember about that. no, like we we'll we will talk about that later. There there's like one there's like one thing I'm wondering is if I want to make like a remember

like like a car flash card thing that's specific for developers or if I want to keep it general because I'm I'm I'm I'm having the impression that actually it makes sense to maybe do something bespoke for developers because especially if you put like an LM in the mix you can actually make something that's a bit more bespoke.

But we'll talk about that later. Okay, great. there's so Do you have a site that has all your things on it? Like like in one like, hey, I have doing this project, this other project, whatever. The once a month I try to send an email of like, hey, here's stuff that I've been working on that seems pretty neat. and also I people should blog more about prompts that they like, by the way. If like today I learned people did. Yeah. Oh, like I like I don't want to be on LinkedIn to to get signals like this. I want to be like on the normal internet. so I I try to share prompts as well. Like today I learned thing from Simon Willis. I just try to do as much as possible.

yeah, I try to learn in public. That's kind of the person that I am. So if people are interested in that, I have a Substack. You can also I'm also very active on like Discords these days. So the Marimma one, the Any Widget one. I'm also like in the fast HTML one from time to time. but Discord is also where people can find me. and I'm on Twitter and places, but yeah. All right. okay, I promise this is goodbye now.

We can actually say goodbye. it was a good session. It was fun. Let's just hang out again. It was fun. Yeah. Yeah, we should totally do that. That was that was really cool. I'm going to try to hook up my note, my game pad after this and I'm going to check this out. But you have successfully sniped me into Mimo. So sweet. Sweet. Mission accomplished. I can now have a cake. cool. Then everyone thanks for listening. There's a pretty full crowd as well. So that was also very nice to see. Yeah. Yeah. A lot of people will be getting the recording.

So I'm going be sending it to all the students.