

QUOTES

- “So you should say, No, even though I can do it, it’s not gonna bring in an insight. This is what I mean by taste. It’s very important.” – Gabor Bekes
- “Having anything other than an in-class pen and paper exam is in jeopardy. Whenever students can interact with technology, then you know, examination as such is is is gone.” – Gabor Bekes
- “AI is at a stage where it can do a lot of things, but we don’t exactly know what. So there is a great room for experimentation. And so you should be brave to experiment, to do things you don’t think you would be able to do, and then kind of go back and try to understand as much as possible so that you can judge it.” – Gabor Bekes
- “I think the big picture is that we allocate resources. That means cutting stuff and then doing much more in figuring out what does AI means for us. That’s the biggest risk. Not doing that.” – Gabor Bekes
- “The barrier is how an organization is able to completely rewire itself. To allow for this technology to become part of everyday life and work and increase productivity.” – Gabor Bekes

KEYWORDS

#TeachingAnalytics #DataAnalysis #ArtificialIntelligence #HigherEducation #DataScience

TRANSCRIPTION

For your convenience, we include a 95% accurate machine transcription of the conversation.

Eduardo Ariño de la Rubia

Today, I am joined by Gabor Bekes, a professor in the Department of Economics and the program head of the MSBA program.

His research includes football analytics, and he has recently published interesting work regarding the preference of football players and who they pass the ball to. He's one of the authors of Data Analysis for Business, Economics, and Policy from Cambridge University Press.

Thank you, Gabor for joining us on Teaching Analytics in the Age of AI.

Gabor Bekes
My pleasure.

Eduardo Ariño de la Rubia

I'm especially glad to have you here because I mean, in many ways, you're the reason I'm in the department. And so we have that relationship over many years now.

Gabor Bekes

Absolutely. I mean, we've been in this business for eight years at least.

Eduardo Ariño de la Rubia

Yeah. And your work sits at the intersection of analytics, research, economics, teaching, and really the way that AI is changing what students learn. So I'm really looking forward to diving into this conversation.

Gabor Bekes

Thanks a lot.

Eduardo Ariño de la Rubia

Let's help listeners place you, right? Before we get into AI analytics and teaching and all that. Can you give listeners the human version of your bio? So what do you work on? What do you teach? How did you end up here?

Gabor Bekes

Okay. So I'm an applied economist, which means that I work on economic questions using data.

And this is how I ended up here to answer your question that my research background is applied in the sense that working a lot or have been working a lot with data for a long time.

I work on topics that are about how people and companies collaborate. Also how organisations work. So in the past I worked on international trade, looking at how companies

decide and end up being part of global supply chains. And now I work mostly on open source software. So how, again, how people rather than companies collaborate, start new projects.

And I also have another research topic which is very different, which is using historical data, archival data, again, to understand firms joining international supply chains or participating in the global economy and how industrial policies may affect that.

Eduardo Ariño de la Rubia

Well that's very cool. And I can see how data definitely feeds into all of those.

Gabor Bekes

Yeah, exactly. So I think one common theme I was often I'm doing so many different topics that I sometimes think, okay, what is the connection? And the connection is very often large and unique data and working with large and unique data.

So that's the research part and then I've been teaching data analysis for like 15 years now. I had written a textbook with Gyborg Casey called Data Analysis, which has been out for a couple of years now.

Eduardo Ariño de la Rubia
Clever SEO naming.

Gabor Bekes
Absolutely. By the way, the first name was patterns prediction causality. And then the publisher, Cambridge University Press said, well, you got to have something that is easy to identify for universities.

Hence the title Data Analysis for business economics and policy exactly because of your point.

Eduardo Ariño de la Rubia
Yeah, that's a fantastic SEO name. It's a great textbook. We use it in the program.

Gabor Bekes
Yeah, we use it indeed and it has grown out of the program. So part of it was developed. I learned machine learning as a way to try to teach it.

Is one way to learn things. And I teach it for social scientists mostly, or people who want to become economists or political scientists.

And so I wanted to understand machine learning to an extent that is manageable for people who are not coming from a computer science background.

Eduardo Ariño de la Rubia
Let's actually move on to teaching a little bit. So when you first started teaching, what did you think students needed from you? And what do you actually think they need now?

Gabor Bekes
When I started to teach, I thought, and I still think that's important, is to show them what's good modelling is, what's good analytic processes are, how to figure out patterns, prediction and causality, how to do that well.

So I think students still need that, but maybe a bit less so. And what I wasn't aware, or what I didn't think at that time is to talk about what's a good question and how to start it.

I think this is something that has grown over time.

Eduardo Ariño de la Rubia

Was there a moment that changed your mind, or was it from students, the field, your own mistakes, just life in general?

Gabor Bekes

I think life in general.

So the first there was a point in time that changed and that kind of led to the birth of the textbook, which is people have studied a great deal of different methods, but they didn't know which one to apply and didn't know what to do with the results.

So that was the birth of the book. That was the reason we wrote the book. It's not that we devised new methods.

But much more than saying, you know, we're gonna curate a subset of methods that we think gonna cover 95% of your use cases and then guide you which one to use and guide you what to do with the results.

There was a clear moment when I was supervising actually capstones and thesis projects, and then I realised that's a problem.

This thing that we need to spend more and more time on thinking about what's a good project, I think this has come about with the wide availability of data sets and the and the easier access to data. I think that's the right word, easier access to data.

Is that now it's much easier to get data, and therefore you want to think about, okay, so now that's not the bottleneck. What should I work on? What should I think about? What is a meaningful question? There's so many things I can look at. Why should I look at A and B and not like the rest?

Eduardo Ariño de la Rubia

So you teach courses specifically at the university directly from the textbook, like you teach that there's a sequence. Can you tell us one of them, what is the course title? But tell us beneath the course title, what is the class really about?

Gabor Bekes

Okay. So there is a sequence. So the book consists of four parts, and I teach two of them. Others, my colleagues teach the other two. So one of them is predictive modelling, and the other is causal inference. So let me maybe talk about causal inference.

So what we teach there is how to understand and devise what are treatment effects from interventions, how we can see there are policy changes, both Of the in the economy, but also at companies, and to understand what are the consequences of that of that policy. And so that's the big picture, I think what we do in the class is think about conditional comparisons. I mean, our business is really about conditional comparisons to figure out what are the right conditions so that we can make a meaningful comparison of treated and control group.

In the end of the day, that's a large part of analytics is about conditional comparison.

It's to figure out what can we learn by comparing meaningful units and in causal inference, it's a causal question, but in a prediction context, it's why would some units, when we compare them, why are they higher priced or larger volume often the case.

And then on top of this, which is not in the textbook, but on top of this, I teach a class called data analysis with AI.

Eduardo Ariño de la Rubia
Tell me more about that class.

Gabor Bekes
Yeah, I will. That's a core of our conversation, I think.

So that class is after people have mostly studied like the core parts of the textbook, they have done descriptive analysis and they have done prediction and they know the elements of machine learning and they know kind of causal inference, or at least the core ideas.

And this class is about, okay, so up until now we try to make sure you understand everything and you do most of your work on your own, or you're able to do it at least.

Now let's take off every control that we have.

And then let you use AI to do things that you know how to do, but faster, but more importantly, to do things that you don't know how.

And so the course is really about getting to a point where you're doing things that you wouldn't be able to do without AI, or doing them much, much faster, and then figuring out how much you need to understand of the work you have done with AI.

What are the parts where you really need strong control and you really need to understand what's going on? And what are the parts that you can say, well, magic. I don't need to know.

Eduardo Ariño de la Rubia

Do you remember a moment that class sounds really interesting, and I bet you get lots of really neat signal from students. Do you remember a moment where either a student really got it or did something unexpected with AI?

Gabor Bekes

This is the second year I'm teaching this. And the course starts in January.

So one thing I remember is when I first started to think about the course one and a half years ago, and then first taught it last year, there's a huge change of how much models hallucinated.

I know I'm not answering your question, but I maybe I will at some point. So I had to change a lot.

So there was, you know, there was student realization, I think last year that the models when you especially when you use paid models, they actually work quite well.

So I think that was last year's story that unlike you know the stories about hallucinations and errors.

Once you actually do a decent job with these models and you pay for them, then they no longer hallucinate or they do very little. So they have become more useful. That was the time that you know racks came out came out. And so simply models have become better in that sense.

And then what happened obviously over the winter period this year is that harnesses Claude Code and those stuff appeared completely destroying my Christmas break because I realised that holy something everything I planned is no longer hard and it's no longer a meaningful thing to show, but instead, oh my God, this is something that we have to do.

And then so this year, the aha moment was really the amazing capabilities of Claude Code and other harnesses.

Eduardo Ariño de la Rubia

It is one of the fun things about teaching a course on the cutting edge is that suddenly a December like this past December can happen where everybody goes home, everybody plays around with these harnesses, and suddenly you realise Oh, I can't teach a course on chatbots.

Gabor Bekes

No, that's true. And I don't want to teach again any so here is my advice to any anyone who br who wants to do teaching, don't teach on the what was your point. What was your

wording edge. The cutting edge. Don't teach on the cutting edge, right? Because it's tremendous stress and work and just don't.

It's a crazy thing to do because you're literally, you know, a little bit ahead of your students.

In terms of the technical things, the capabilities, there is no set curriculum. I mean, it's exciting, right, to figure this out, but it's also very hard.

So I think this year, in answering your question, I think this year the big story was compared to just typing into a chat bot when you are able to have a model that working on your computer and doing tasks, you know, that's a very, very different proposition.

And so I think that was the aha moment. I think the and then the other aha moment was like how, you know, over three weeks.

So in the in this class, in the last part, in the second part, it's basically a three-week run where they work on a single let's call it capstone project from zero to hero, and there are groups of three, and they have to work on a complex problem set where none of them knows all the parts.

So it has to, you know, it includes NLP, it includes complicated econometric or course of inference models, it includes data collection, and it resolution, we teach all of them over a year, but like students coming from different parts, you know, if a second year economics master student will know much more econometrics than a business analytics student, who will in turn know much more about handling data than a traditional econ student, and so on, right?

In their group, everyone knows something, but not everybody knows everything. And certainly I asked them to do a lot over three weeks.

So I think realising how far you can go is another experience, hopefully.

Eduardo Ariño de la Rubia

It sounds like a pretty great aha moment. And what you said about teaching at the edge is true.

This year in my deep learning course, there were times where I discover there was a fault in an open source library, and I was like, great, I need to get a patch added to this open source library before two weeks from now when I'm teaching this fix. It is not for the faint of heart.

Gabor Bekes

No, I think that's for sure.

Eduardo Ariño de la Rubia

I think in general, teaching in the age of AI analytics, particularly is hard. Can you think of an assignment, an exam question or a project type that used to work. There was a bread and butter way of either teaching or evaluating students that is just now broken because of AI.

Gabor Bekes

Yes, I can. All of them.

Eduardo Ariño de la Rubia

Can you say more?

Gabor Bekes

All of them. It's bonkers. Having anything other than an in-class pen and paper exam is in jeopardy.

Whenever students can interact with technology, then you know, examination as such is gone.

Assignments are mostly there so that if someone wants to practice, they can, but it's a very moderate way to tell apart effort. It is.

It still is, but it's much less as before. There is no single classic university type activity done by students that is not massively undermined by AI. And I think university professors, not many people appreciate, or administrators may not appreciate, or outsiders may not appreciate how taxing this is to rethink quite a bit of what you're doing.

And then some people rethink, some people don't, but it's a very hard thing. And it's still just the beginning, right?

We don't know like we are still teaching mostly the same things, and we're thinking about measurement of students' effort, which to be honest is a secondary thing.

And we are thinking less about okay, so what should we teach?

And I think you know our program and you are you and me are special in that way because we think much more than many other programs and many other people because we are interested in this genuinely.

But we, you know, we just started to think about so what should the university education look like in the age of AI where AI will be able to do a lot of things at an 80 to 99% or to 110% quality.

Again, you and me and our program we have been thinking a little bit about this, but it's you know it's just the beginning.

So let me give you one example but I think human, you know groups of humans and agents working together and then thinking about that and teaching that or I'm not sure teaching is the right word experimenting with it or letting them try things.

That's something that I do now that I didn't do last year or two years ago.

Eduardo Ariño de la Rubia

I agree that at the end of the day, we're in this new world now where intelligence doesn't seem to be quite the bottleneck that it previously did, at least not raw intelligence. You can now buy it by the token. And yet the reality is that humans aren't going to go away anytime.

And we did a survey when we had our alumni event and the beautiful rooftop in Budapest, where we asked, did people think that AI was going to replace humans versus augment humans? And the reality was that most of the room thought augment.

But if you're augmenting humans, you have to pick the right humans, which means that you need to have some idea of the competence of those humans. I think we used to have good signals of competence in the field, or at least we approximated them in this new reality.

Do you have an intuition is what skill did used to signal competence, but doesn't anymore? And what actually signals competence now?

Gabor Bekes

So I think in the past, if you were a good computer science person who were able to write, you know, I give you a spec, and then you're able to write a good code that is able to do exactly my detailed spec.

That was a super useful.

Eduardo Ariño de la Rubia

That's right.

Gabor Bekes

I hired assistants based on that. This is basically still there, but it's much less important. I think what is the most useful skill.

But extremely hard to measure is taste.

Eduardo Ariño de la Rubia

Go on, say more.

Gabor Bekes

Taste is when you have the experience and the ability to judge if something makes sense or not, but not like in a very concrete, you may run a regression on a data set that is correct in the sense that you know the right formulae are applied, there's a result, it's put in a table, and it's okay.

I mean, not okay, it's good. It's what it's supposed to be.

But whether you should run that regression, whether that model makes sense for the question that you have, but not just superficially, but at a deep level, whether the data is appropriate to even ask that question.

Or you would need something else. So you should say, No, even though I can do it, it's not gonna bring in an insight. This is what I mean by taste. It's very important.

It's hard to gather, but it's something that is very useful.

Eduardo Ariño de la Rubia

Taste is also hard to teach.

Gabor Bekes

So one of my favourite movies and something that I often talk about in my class is the film called Arrival. So arrival is when you know aliens arrive and they speak unknown language, and then linguists and other people try to figure this out.

And through the process of trying to learn that language, their way of thinking changes.

And so this is how I think about taste. You can't teach taste directly.

You can showcase a lot of good stuff, and as people work through a lot of good questions and a lot of good case studies and hear the experience of people with valued experience, even though they think they learn coding and they think they learn regressions, and they think they learn machine learning, and they think they learn cloud computing, and they think they learn deep learning.

Sure, they do that, but by learning all these stuff through good examples, they ideally develop, you know, what will become taste.

Eduardo Ariño de la Rubia

So imagine that it's three years from now, and you and I are rebuilding the curriculum, the MSBA curriculum. What do you think that we will cut, compress the mode, basically? What will we shrink?

And what are the things that will really be on the table and highlighted that may not be as highlighted today?

Gabor Bekes

So we, I think changed the curriculum about 20% a year. We have been doing that. You know, we moved from R to Python, we increased cloud computing.

We, you know, reduced classic MLP in favour of you know what you're teaching, much more deep learning. We increased the role of AI in a variety of our courses.

So there is anyway constant change even before AI. I'm very happy with the content that we have now.

And I don't, apart from increasing this collaboration, working in teams of humans and agents. That's what I see a growth area in the short run.

I don't really have anything in my mind that, oh, I have this target and I want to move toward that direction. The technology and the practices change so much.

We had a discussion with a colleague about agile, whether how much that is important, and he's saying, you know, well, we are now running this dark factory kind of approach. So maybe managing dark factories.

So for the listeners, dark factories, this concept that machines are able to work on their own. So no constant human oversight is needed. Therefore you can switch in the lights.

And you know, dar dark factories just appeared in some manufacturing components in the world. And now there are certainly analytics that is done in this in this dark factory where computers are running for hours without much oversight.

How you manage this, I don't know. So I you know, so I think you know, gradually more towards working in this space of human computer AI collaboration.

Eduardo Ariño de la Rubia

I agree completely, right? I think we're kind of at the dawn of this agentic age, where realistically you and I have discussed this, every employee, or at least most employees, even if they're individual contributors, are going to themselves be managers. They're going to be managing these dark factories and these Swarms or groups of agents. I actually do think that we're just now beginning to see how that's going to play itself out. And I can imagine three years from now that could be a much larger component of what we teach.

Gabor Bekes

Yeah. I and how much we still want to teach the basics, again, partly because it helps to develop taste.

You know, you still need to be able to understand the core principles and simpler stuff. So I would not let that go. So yeah.

Eduardo Ariño de la Rubia

So students are using AI. We encourage them in a lot of the courses to use AI. They're using them on their own. Can you think of a time that a student surprised you with their use of AI?

They accomplished something, or they built something, or they got somewhere that really was impressive to you that you didn't know was possible or that you didn't see coming?

Gabor Bekes

So the answer is no. University policies generally try to curtail AI use, and therefore it's hard to see what is exactly AI.

I think in my data analysis at AI class, there were a bunch of projects that were really good. I hope they would be good. So I wouldn't call it a surprise, right? Because I really hope that they would be good stuff. They were.

Okay. So one thing is the fear that because it's very hard to judge effort when people use AI, we should repress it as much as possible.

I think that's one risk is that because you know, very often you design, okay, so I'm gonna measure what people have learned and kind of walk backwards. And if you do that, then you want to repress AI? And I think sometimes you absolutely should.

So I often have zero tech classes.

But people have to can only have pen and paper, literally pen and paper. I used to allow tablets.

Now that you can take pictures and you can digitize your handwriting with AI, the value of a tablet has gone down as a writing thing.

So I'm actually having classes where they can print out slides, it's pen and paper, it's zero tech. So I think there's a divergence in that sense of sometimes you want to allow people to use AI, sometimes you want zero AI.

I think this middle ground is problematic. And I think one risk is that universities because, you know, so if you have 500 students, you need to give them a grade. You can't have oral exams with all of them. So that's one thing.

I also think that the real risk of people not learning anything because they rely on AI for everything is another, you know, it's maybe the opposite risk, and I think it's there as well. And therefore you need to have zero tech environments.

Overall, I think the fear is that universities do not allocate enough resources to figure out how to deal with a vastly changed educational environment.

I think this is like in summary, I'm trying to advocate in my university that we need to stop doing some things that we're doing, and instead do much more in relation to AI. You know, if we have hundred instructors.

Maybe we should have 95 and use f the money to buy your favourite AI provider tokens for students for six months and then teach them how to use open router and have you know open weight models on the cheap.

But these are the details. I think the big picture is that we allocate resources. That means cutting stuff and then doing much more in figuring out what does AI means for us. That's the biggest risk. Not doing that.

Eduardo Ariño de la Rubia

So Gabor, finish this sentence. By 2030, which is not so far from now, right? By 2030, I think we'll be surprised that we spent so much time teaching students to blank.

Gabor Bekes

It's a wonderful question. I have no idea. If I knew I would try to change that. You know, the AIH is only, let's say two years old. Before that, it was just a toy, right?

So it's only, you know, I would even go as far as it's, you know, the real change happened six months ago. The real change that affects work and that affects but let's say, you know, a year or two ago.

One thing that economics teaches us is that actually the effect of completely new technologies on what we do, what the work takes much more time than we think because we live, you know, many of us live in a bubble where same people who talk about AGI coming tomorrow or the day after tomorrow.

Or if not, then the day after the day after tomorrow.

Eduardo Ariño de la Rubia

You and I both know when somebody impressive is hired at Open AI. Like we like we're in that bubble.

Gabor Bekes

Right. And so clearly, you know, this is an amazing interesting technology, and it has I think it has a tail end potential of being bigger than anything ever and changing completely our lives in five years, right?

I think in the tail end of the distribution, I don't know, one percent, five percent, ten percent, I don't know, but it's possible.

The most likely outcome is that this is something that is very important comparable to electricity, the internet, Zoom, something like that, right? So we don't know where exactly potentially let's say twice as important as the internet.

But what we learned from economics is that it takes decades for a completely new technology to change deeply how we work and how we operate, because the human bottlenecks, the adoption bottlenecks are much bigger than people anticipate.

The organizational bottlenecks.

The biggest difficulty of AI adoption is not that your computer will not run, will not be able to communicate with the token provider or the model provider because it's too slow or whatever.

That's not a barrier. The barrier is how an organisation is able to completely rewire itself.

To allow for this technology to become part of everyday life and work and increase productivity. We know that there's growing evidence that people do much more with AI, but does it affect the bottom line?

I think that's much more questionable now. You know, it's going to, but it's gonna take time. It took decades potentially to actually see productivity improvement due to the internet, right?

Which is very clear in terms of price comparisons, in terms of a lot of things. So I think again, there's a tail possibility, which I don't know. I'm not an expert.

My main scenario is that it changes a lot of things, but it's slower than people in the bubble think it's going to play out for the whole economy to have an impact that is just vastly different to other technologies.

That does not mean, of course, that in the next five years there will be fewer marketing assistants and hopefully more nurses, or you know, more people in healthcare, or more people in elementary education, or more people in the forests, right?

So I hopefully there will be more of that, because it's good for humanity. And marketing is certainly good for humanity, but maybe this transfer is not terrible.

So I think my view is that there will be fewer people working in certain knowledge work jobs.

Overall in the in developed economies. But people have started different jobs. There used to be, you know, lift operators that don't exist anymore. There haven't been yoga teachers up until very recently.

So there are new jobs coming up and new occupations. So I think it's going to have an impact. I can't answer your question original question, but I just wanted to point out as a closing argument that it's a very, very large shift.

It's a huge impact in education because we're in the front line, but then it's going to take quite a bit of time for the whole economy to spread. We are just in the beginning.

Eduardo Ariño de la Rubia

I love the way you framed it. I'm going to bring it down here in the last question to just a personal question about you and your productivity. So you use AI. Can you talk just for a minute about how has AI impacted your personal productivity and what is your preferred AI stack?

Like what does Gabor actually use when he wants to just get down with AI?

Gabor Bekes

So I experimented with a bunch of stuff. I mostly use cloud code, even though I use Gemini and ChatGPT for certain tasks that often are not work related.

But for work, I just use cloud code because I'm not as much as a geek as you are, and I don't want to experiment that much. It's good enough, and I don't want to change every month. And so how do you how it affected?

So I think I do a lot of useless side projects that I wouldn't do.

to experiment and to have the aha moments.

I review and write and that's an increase in productivity, even though I'm at a level where I used to have junior people so it's a let me just talk about one thing which I just read recently that other senior engineers kind of feel is that you're supposed to work less because of AI.

But now I'd rather do things myself, let's say write code than outsource it to a research assistant whom I would have hired in the past. Now I don't hire people for certain tasks.

I do it with AI, which means I work more I'm not sure about productivity, but do I work less because now it's easier the answer is no, I do more because rather than outsourcing I do it myself. I also work on more projects than before.

And I think I also do things that would have been too complicated. I'm not comfortable you know writing Python code myself, but with AI I do text processing and working with text.

Again, I have no formal training in that I know the basics but I feel much more comfortable with that. So I use AI for many things.

Have it completely changed what I do, I think the answer is no.

Eduardo Ariño de la Rubia
Back to augmentation.

Gabor Bekes

And certainly so the final point is that I'm still to be honest with you, a lot of what I do is still experimentation.

So I'm still trying, rather than bringing it to into production or being the AI product, the final version, I still do a lot of experimentation. Does this work? Does this doesn't work? And prototyping.

So I do a lot with prototyping in the sense that trying out stuff with AI, and then if I like it, then I work on it more.

Eduardo Ariño de la Rubia

What would you want students listening to this conversation? Well, students or potential future students to really remember about this conversation.

Gabor Bekes

So I think the number one point is that AI is at a stage where it can do a lot of things, but we don't exactly know what. So there is a great room for experimentation.

And so you should be brave to experiment, to do things you don't think you would be able to do, and then kind of go back and try to understand as much as possible so that you can judge it. Experimentation is very important.

If you have a supervisor, a university try to get money to buy tokens and to use that for experimentation. This is the most important skill also to figure out what works.

Eduardo Ariño de la Rubia

Well, Gabor, I think that's all the time we have for today. Thank you very much for joining us. And I'll see you around the hallways.

Gabor Bekes

Yeah, thanks a lot.