Model Deployment: Monitoring, Diagnostics, and Predictive Concepts

WELCOME TO OUR WEBINAR

Mikhail Golovnya
Senior Advisory Data Scientist

David Peralta
Area Marketing Manager

WEB-AUDIO:
Please make sure you have your computer audio system activated and your speakers turned up.

QUESTIONS:
You can enter your questions at any time in the questions section.

About Our Speakers:

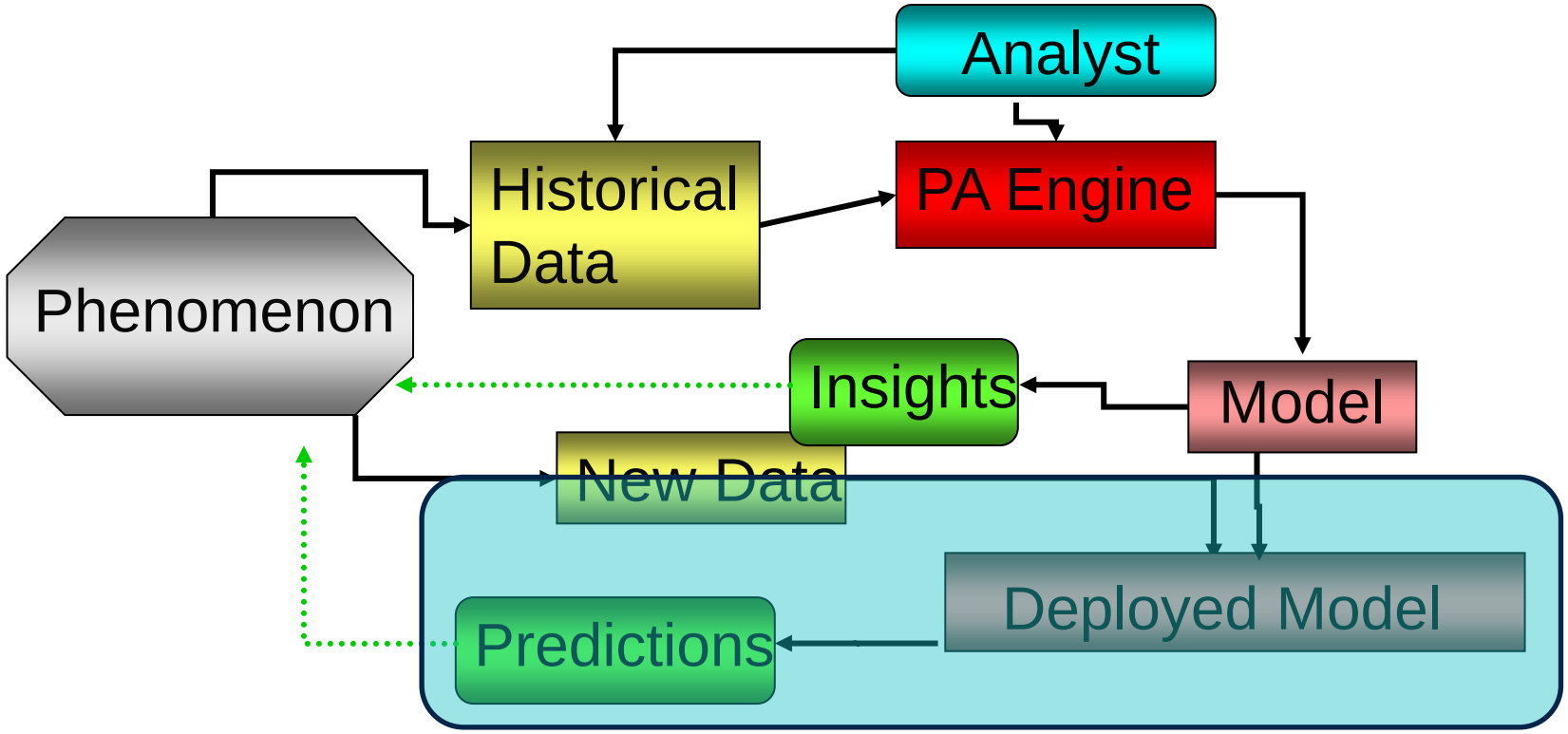
Mikhail Golovnya

Senior Advisory Data Scientist

Mikhail is a Senior Advisory Data Scientist at Minitab. He has been prototyping new machine learning algorithms and modeling automation for the past twenty years.

Mikhail has been a major contributor to Minitab's on-going search for technological improvements among the most important algorithms in Machine Learning.

Predictive Analytics: The Big Picture



Use historical data to **gain insights** and **make predictions** on the new data

Predictive Analytics Workflow

Survey 1

- What models would you like to deploy?
  - Models only available in Minitab Statistical Software (CART, TreeNet, Random Forest, Regression, MARS)
  - Models available in Python, R, etc.
  - I do not need to deploy models

Deployment Using Minitab Connect

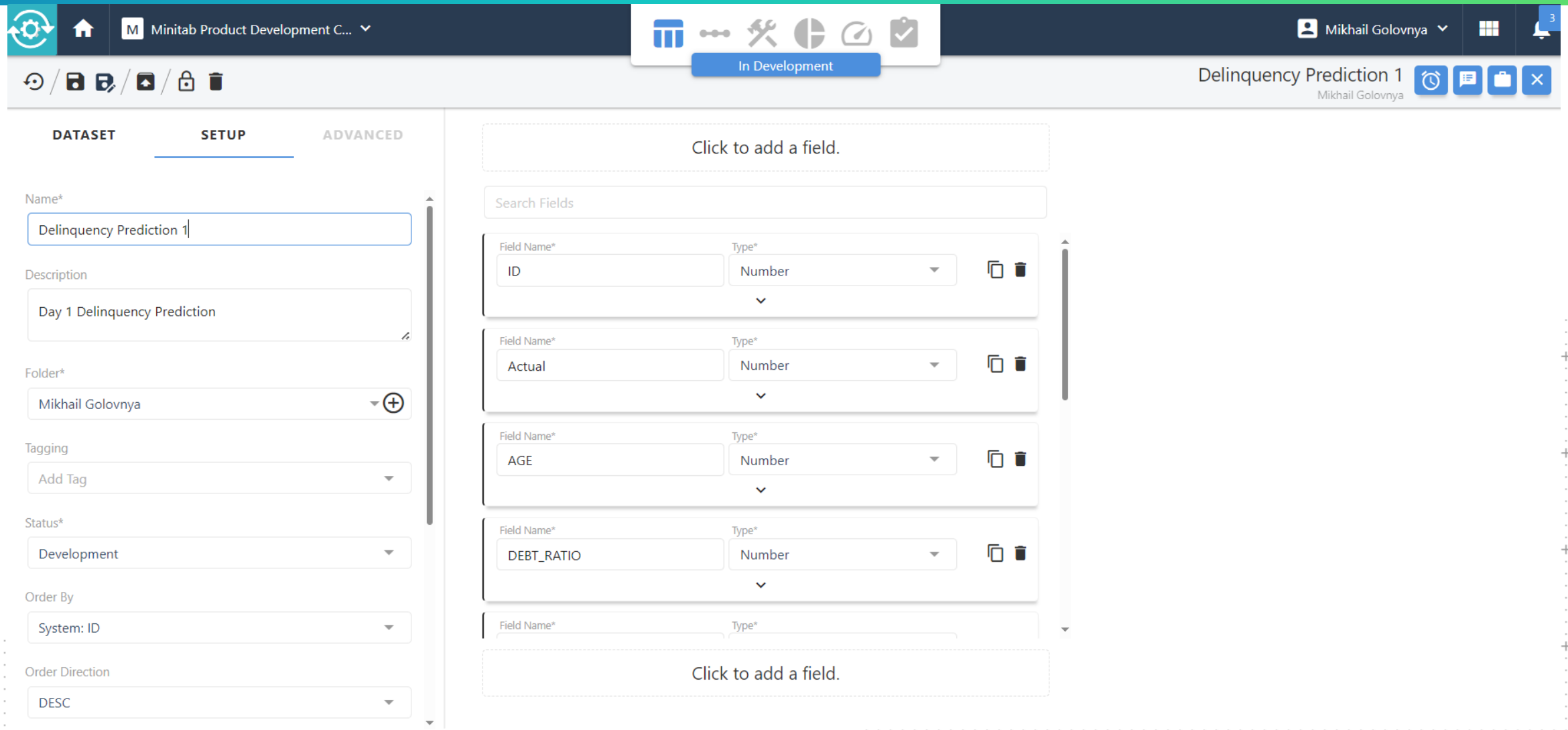
Delinquency Prediction Model

- **Delinquency Prediction** in Banking (Kaggle)
  - Predict who will experience at least 90-days past due or other delinquency within the next 2 years (about 6% of the accounts)
  - 108,376 instances and 6 predictors

Model Selection

Best Model within Type	Average -Loglikelihood	Area Under ROC Curve	Misclassification Rate
TreeNet®*	0.2140	0.6997	0.0608
Random Forests®	0.2871	0.6717	0.0606
CART®	0.2357	0.6700	0.3705
Logistic Regression	0.2212	0.6496	0.0606

Setting up a Dataset for Scoring



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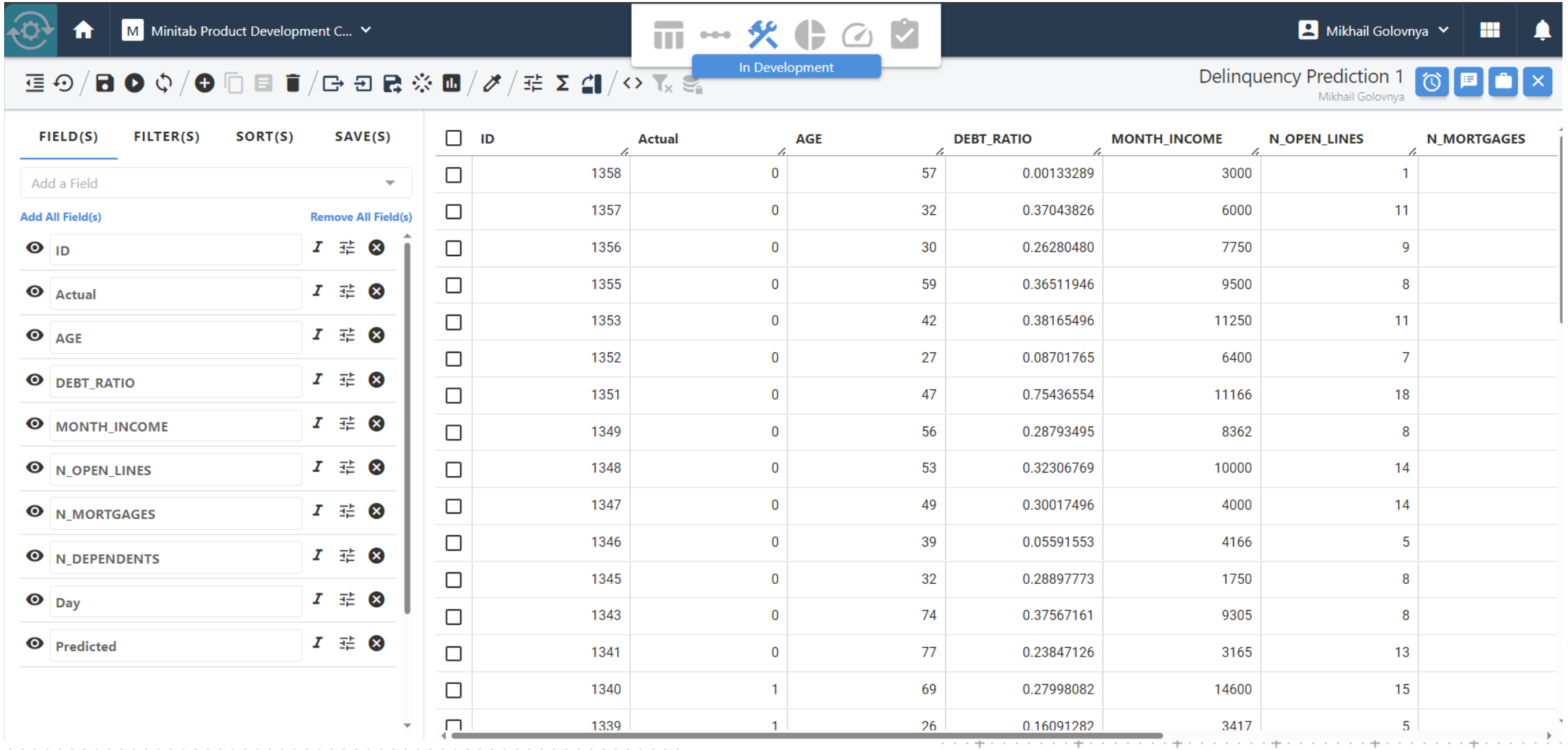

ID	Actual	AGE	DEBT_RATIO	MONTH_INCOME	N_OPEN_LINES	N_MORTGAGES
1358	0	57	0.00133289	3000	1	
1357	0	32	0.37043826	6000	11	
1356	0	30	0.26280480	7750	9	
1355	0	59	0.36511946	9500	8	
1353	0	42	0.38165496	11250	11	
1352	0	27	0.08701765	6400	7	
1351	0	47	0.75436554	11166	18	
1349	0	56	0.28793495	8362	8	
1348	0	53	0.32306769	10000	14	
1347	0	49	0.30017496	4000	14	
1346	0	39	0.05591553	4166	5	
1345	0	32	0.28897773	1750	8	
1343	0	74	0.37567161	9305	8	
1341	0	77	0.23847126	3165	13	
1340	1	69	0.27998082	14600	15	
1339	1	26	0.16091282	3417	5	

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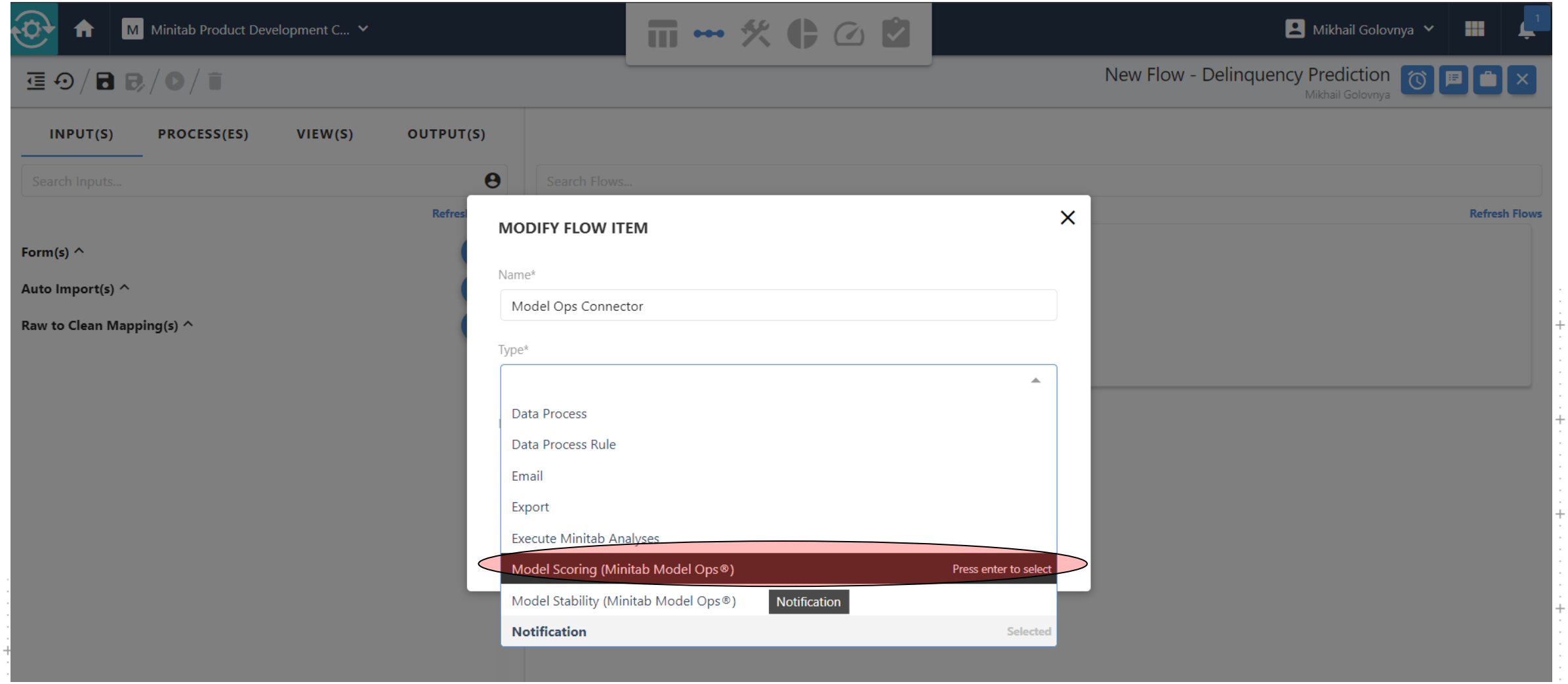
Creating a Model Ops Scoring Flow in Connect



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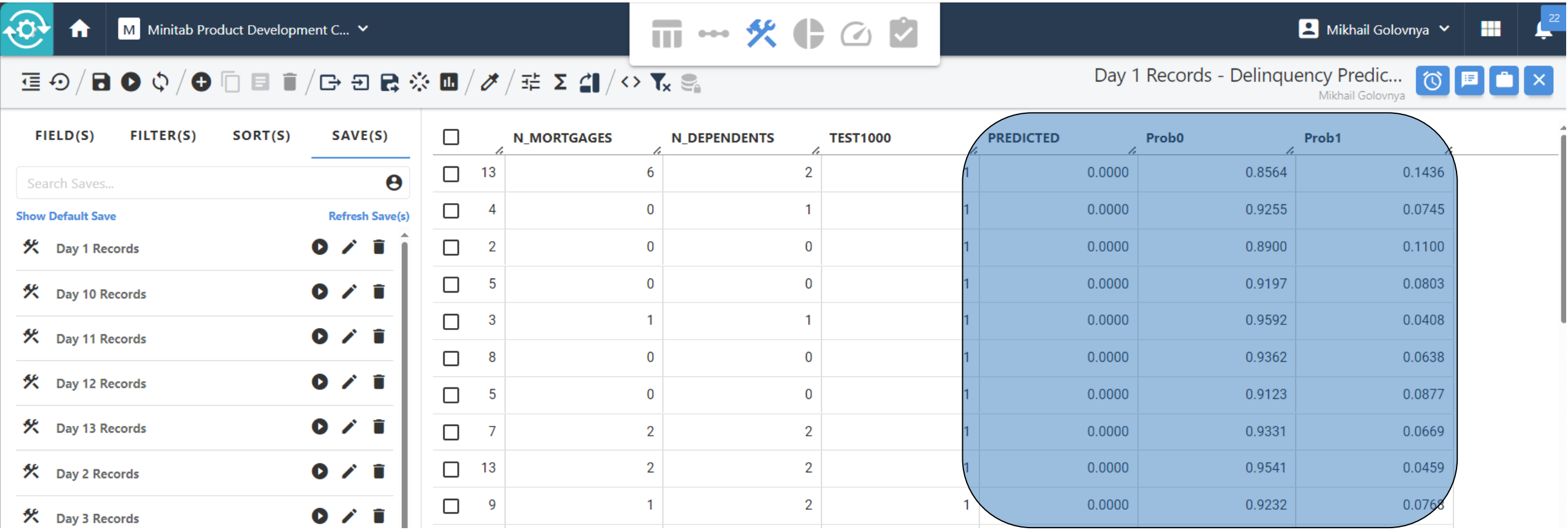
Executing Scoring Flow in Connect



Model Monitoring in Model Ops

Model Monitoring

Any predictive analytics model is based on **a snapshot in time** (historical data)

As time goes on, **things change**!

Data Drift – the data no longer represents the original time window

Model Drift – the model no longer performs as expected

Survey 2

- Do you need to monitor deployed models?
  - Yes
  - No

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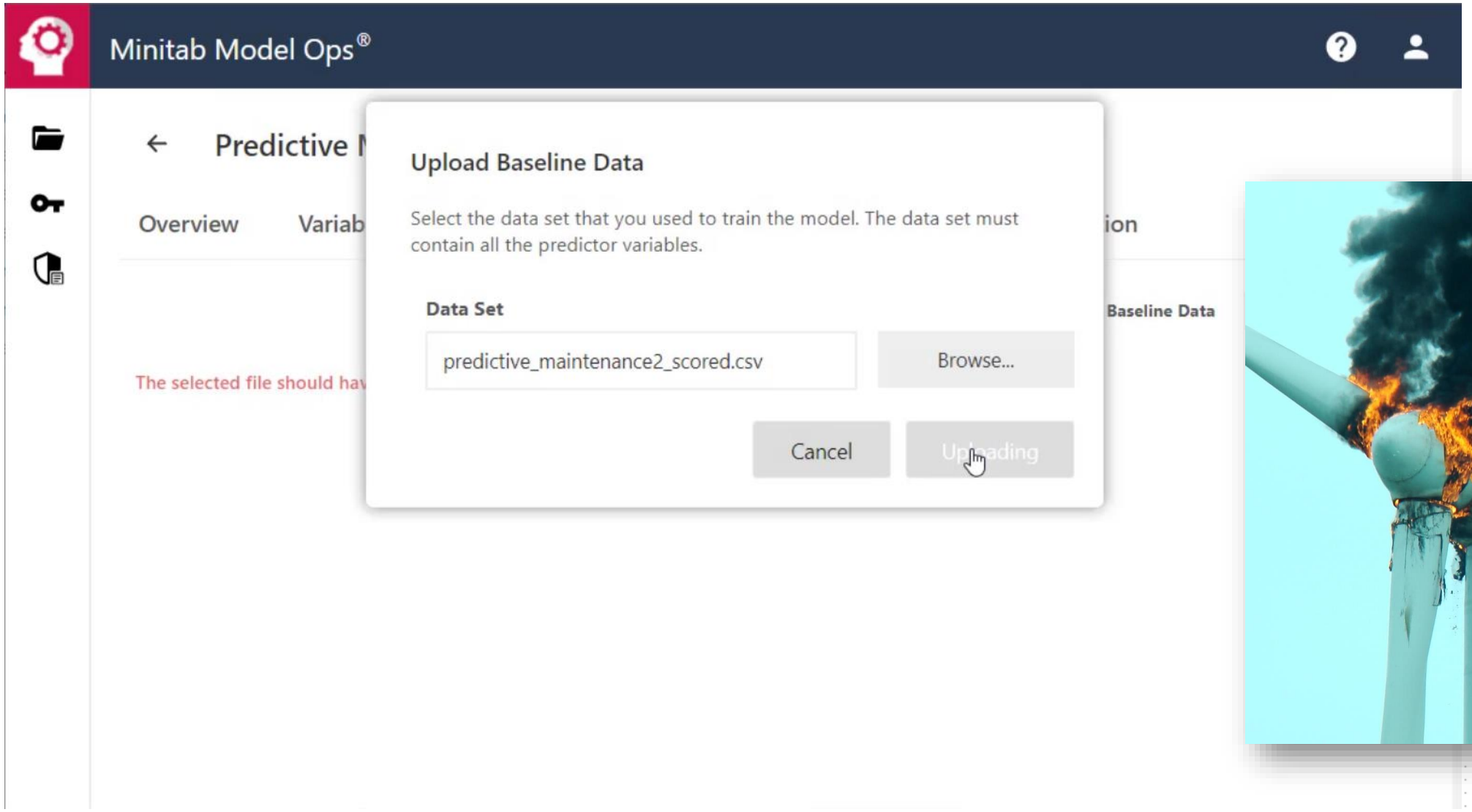
Uploading Baseline Data



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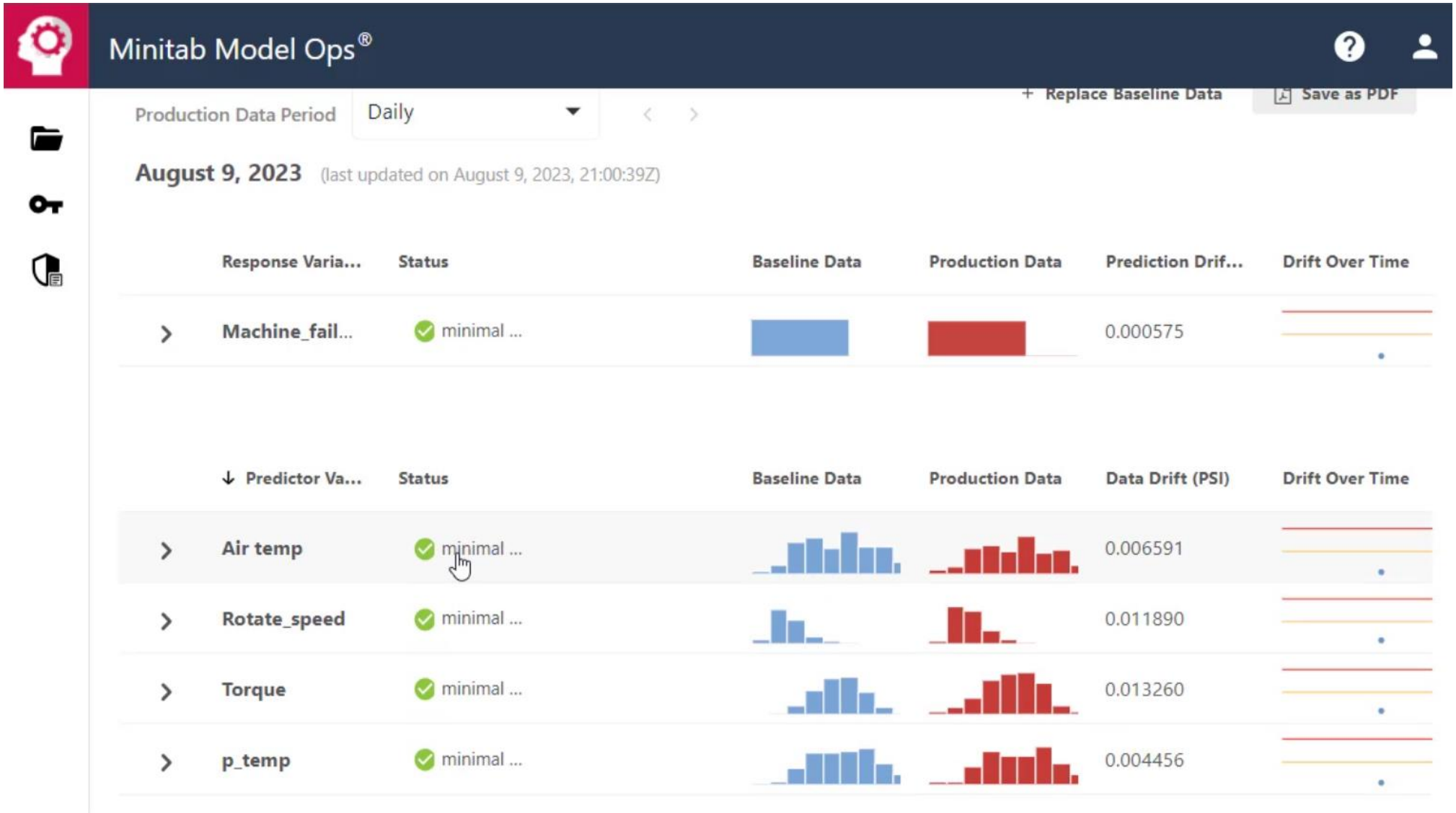
Example of Minimal Data Drift



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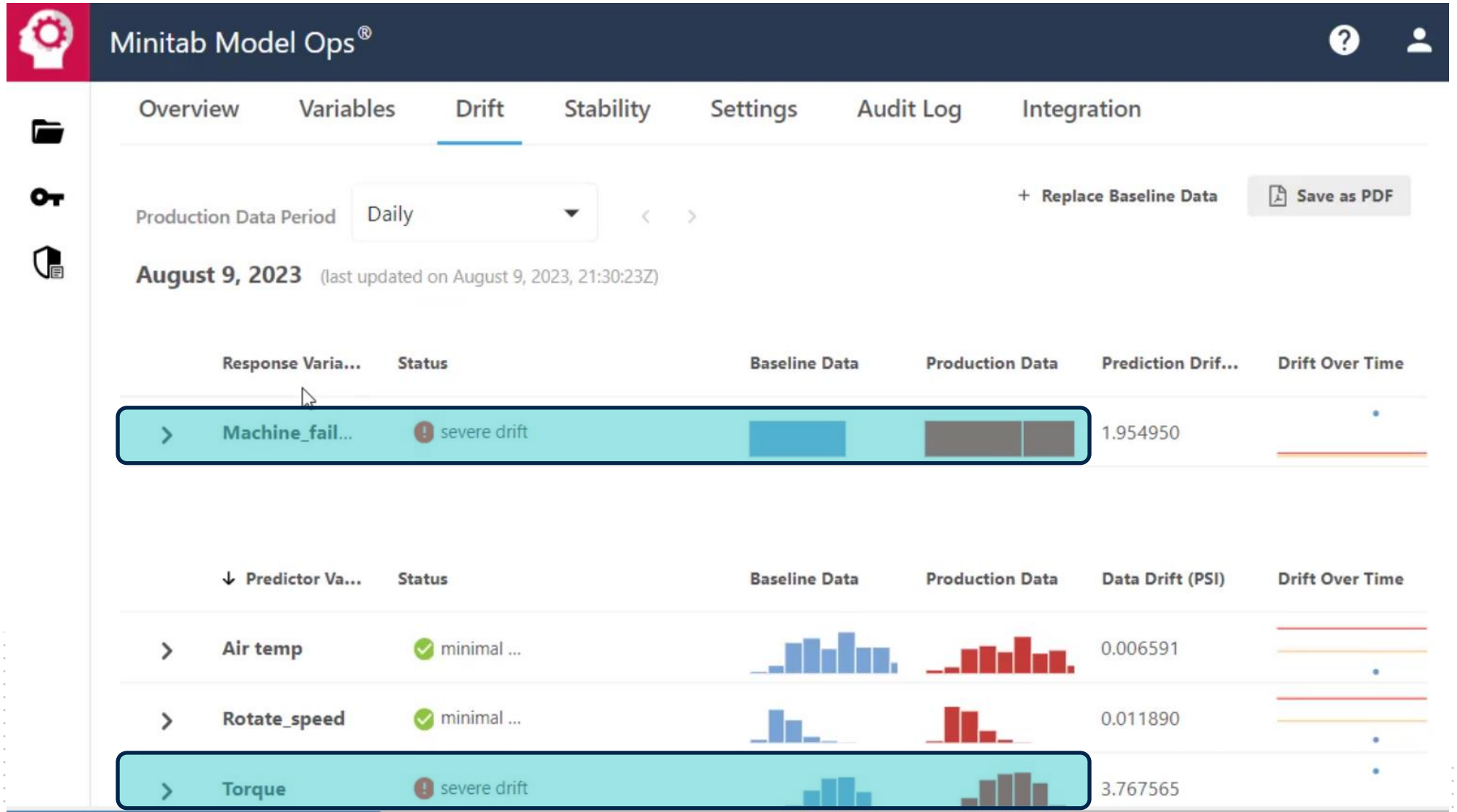
Example of Severe Data Drift



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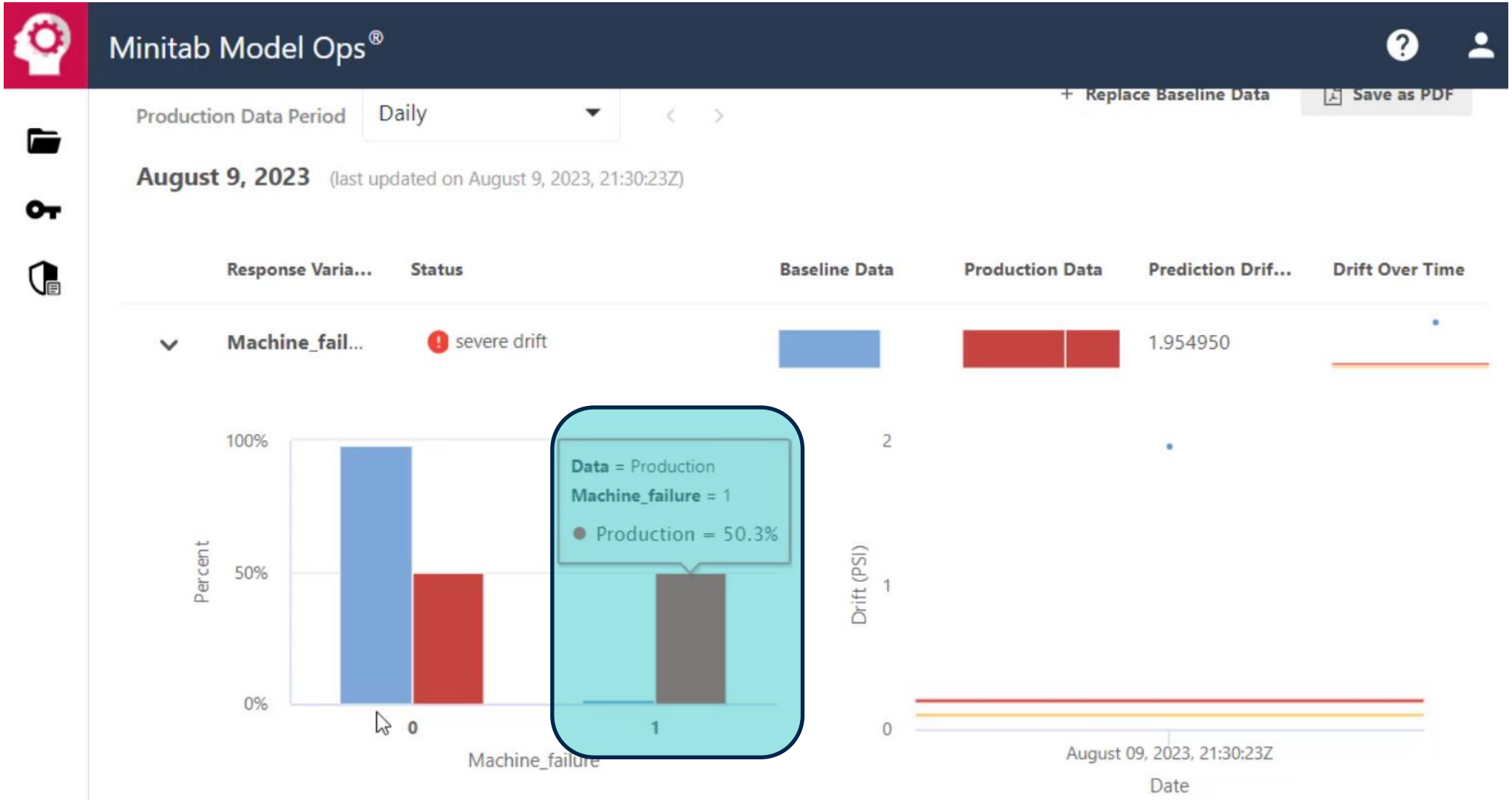
Severe Data Drift: Response



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Severe Data Drift: Torque

Monitoring Model Stability/Performance in Model Ops

- **Model stability/performance monitoring** (unlike the data drift) does require knowing of the actual response
  - In many cases, the actual **RESPONSE** is known at some point later in relation to the scoring
  - Record matching is done via a specially supplied **ID** variable
- Model Ops allows to keep track of up to three different models built on the same dataset
  - Only one model is designated as the production model (**champion**)
  - The other two models (**challengers**) are competing with the production model
  - The models are monitored in terms of performance (stability)
  - A challenger model can be promoted into champion based on the results of monitoring

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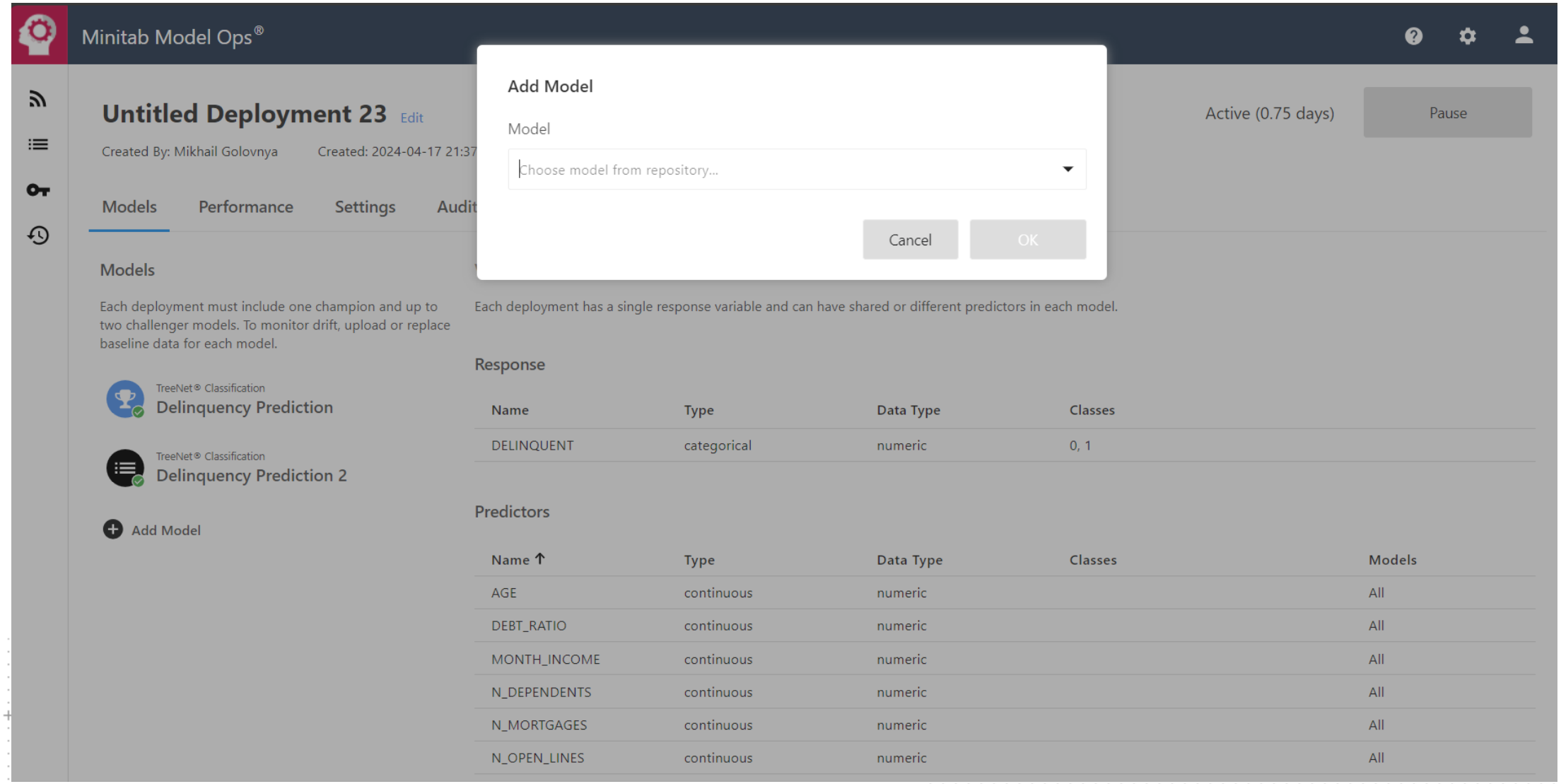
Adding Challenger Models in Model Ops



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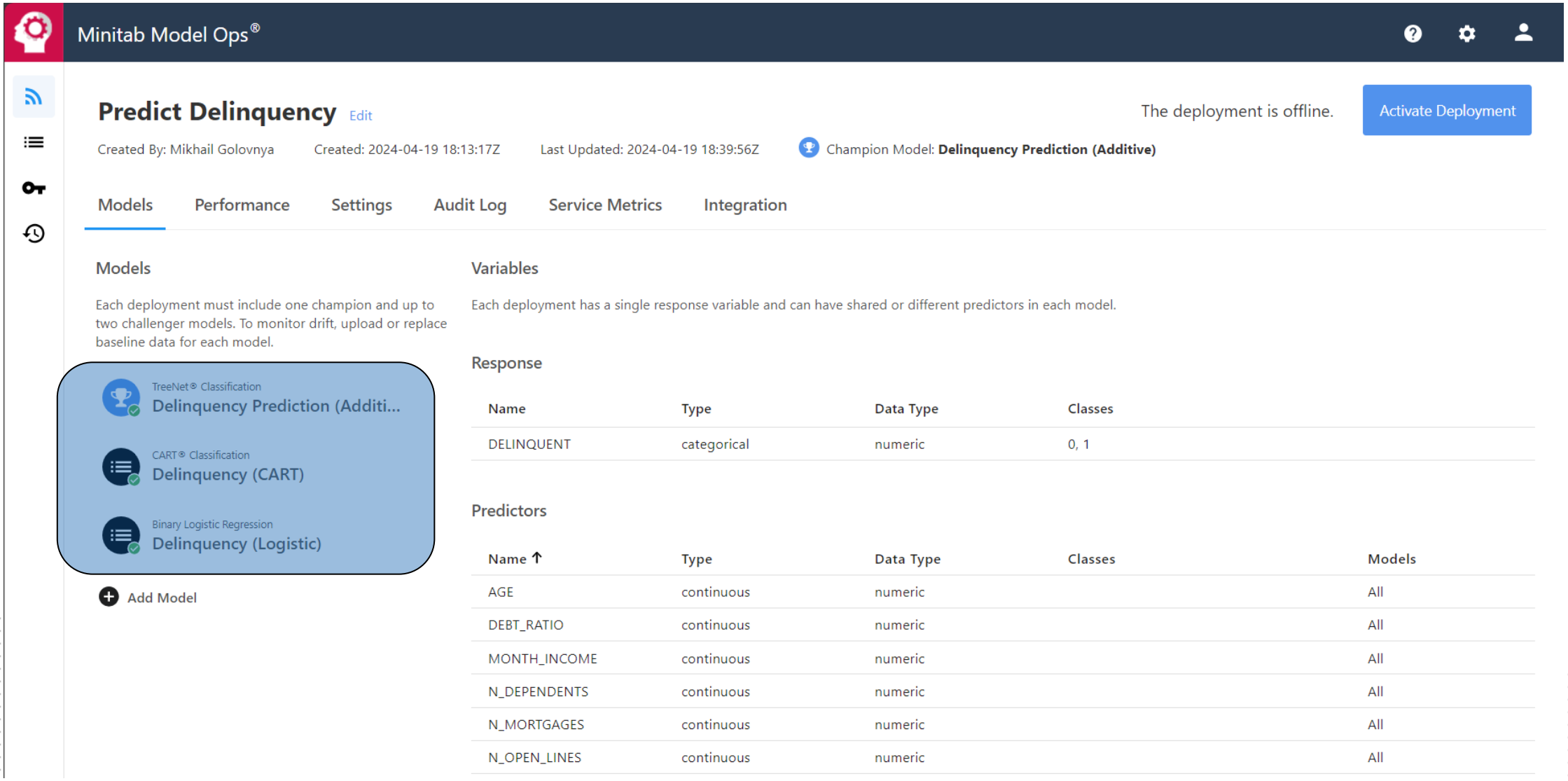
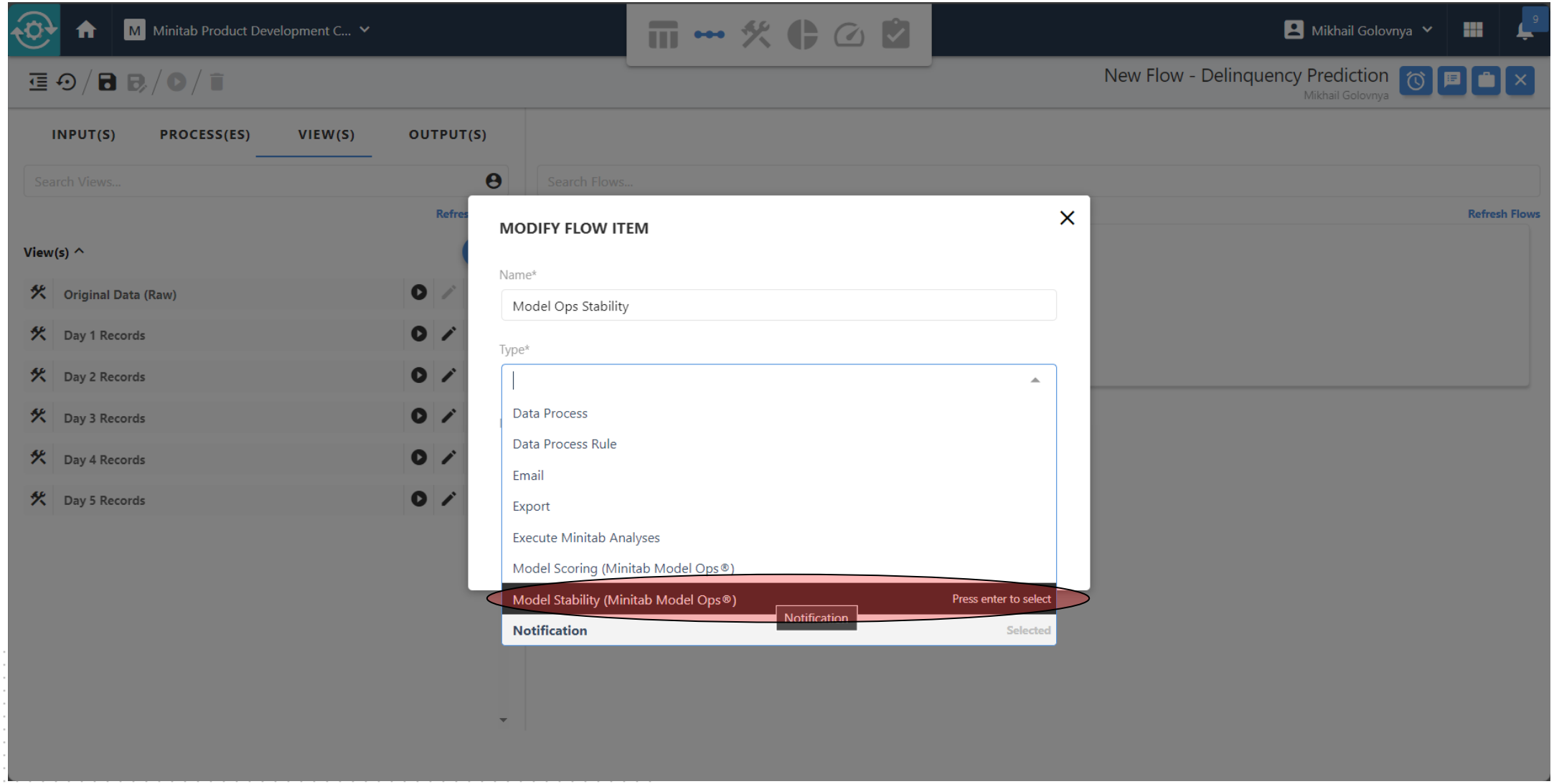


Creating a Model Ops Stability Flow in Connect



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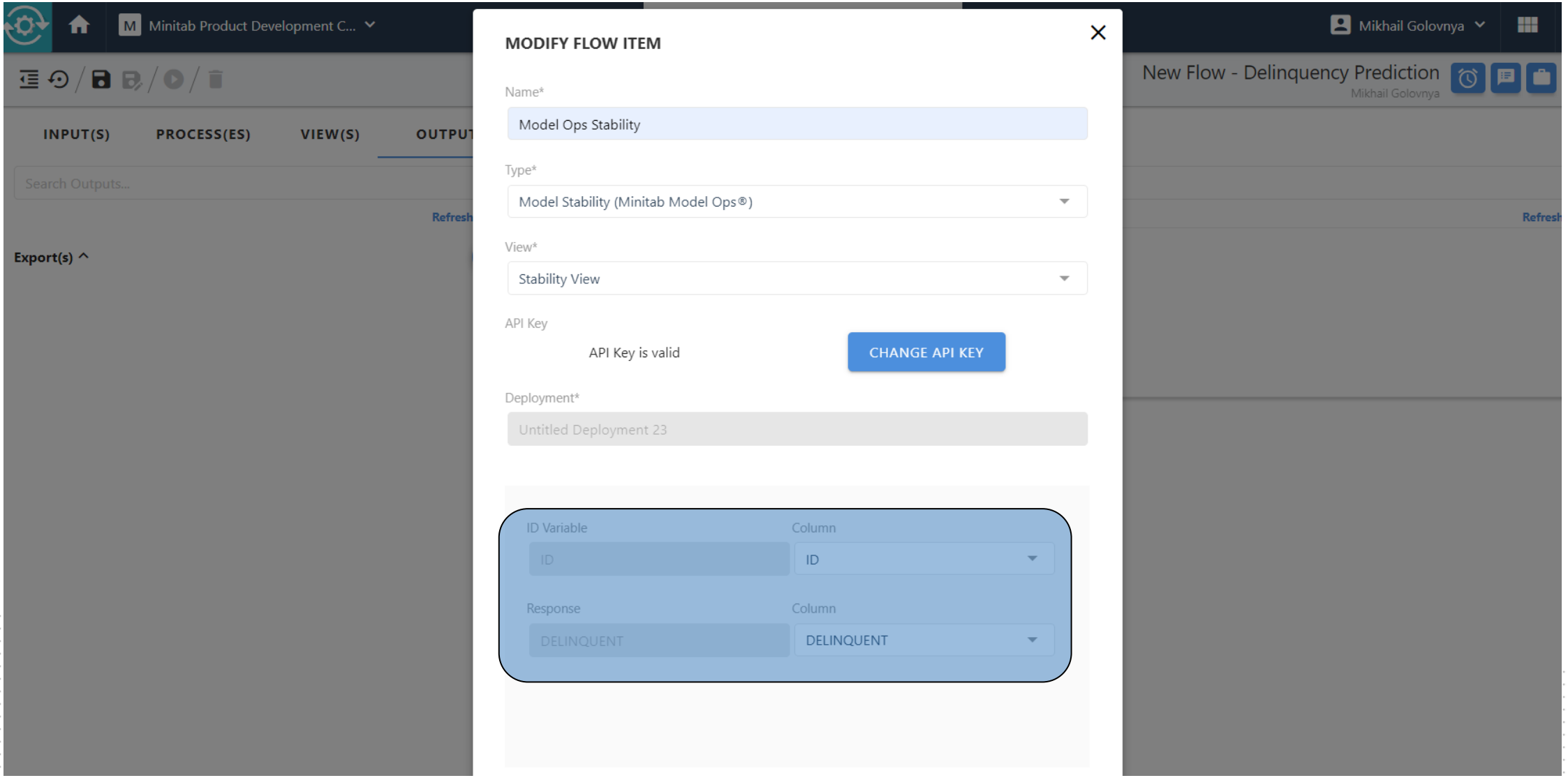

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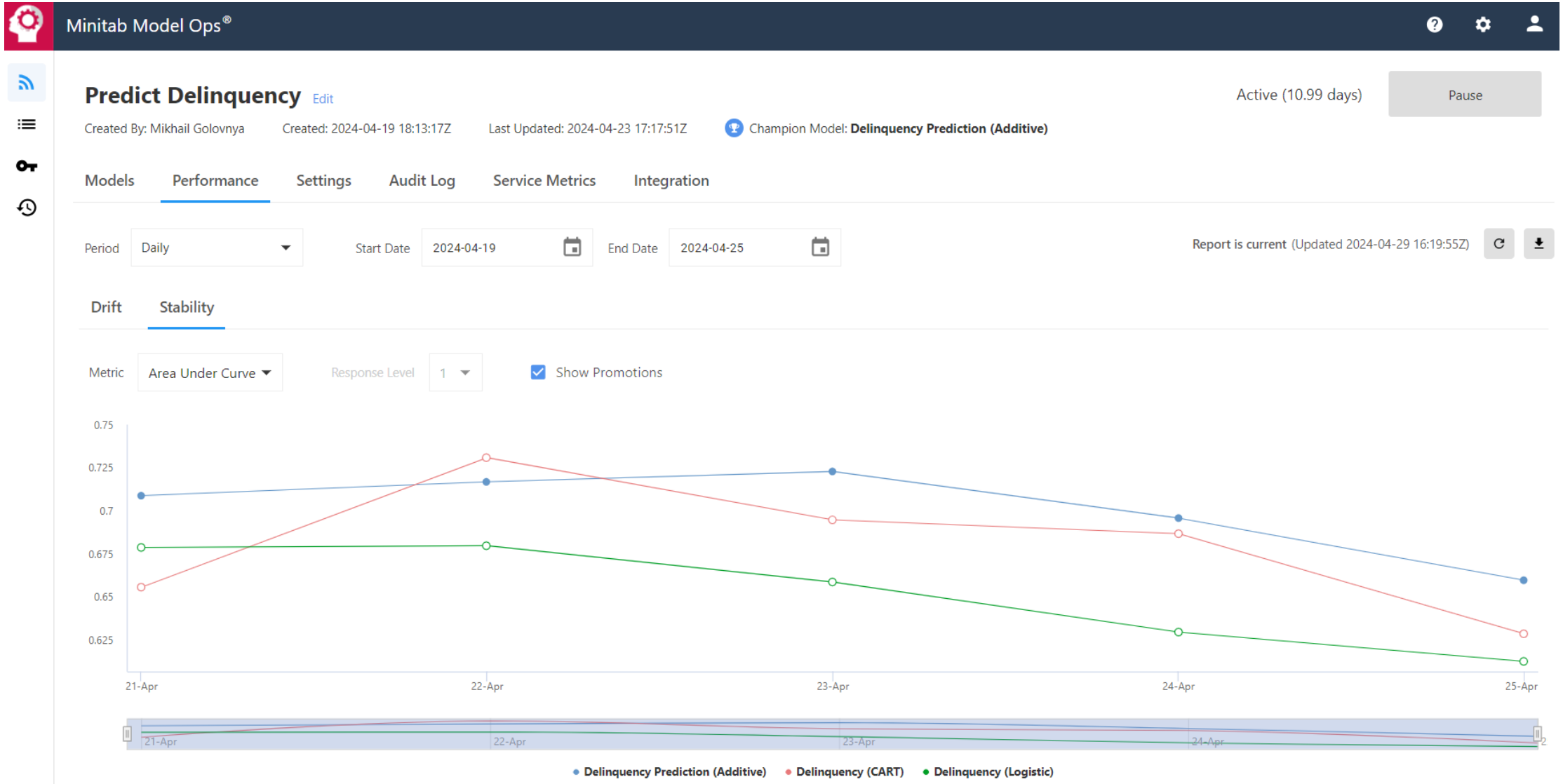
Model Stability Report



The Future of AI:
A Philosophical Inquiry

Different Types of AI

- **Reactive Machines:**
  - These are basic rule-based systems that operate based on predefined rules.
- **Expert Systems:**
  - These are computer systems that mimic the decision-making ability of a human expert in a specific domain.
- **Machine Learning (ML) Systems:**
  - ML is a subset of AI that focuses on developing algorithms and models that enable computers to learn from data.
  - Types of ML systems include supervised learning, unsupervised learning, and reinforcement learning.
- **Neural Networks:**
  - Inspired by the human brain, neural networks are a key component of many AI systems.
- **Narrow AI (Weak AI):**
  - These AI systems are designed and trained for a specific task or a narrow set of tasks.
  - Examples include virtual personal assistants, image recognition software, and language translation services.
- **Limited Memory:**
  - These AI systems can learn from historical data to make better decisions.
  - Self-driving cars often use limited memory AI to navigate based on past experiences.
- **Self-aware AI:**
  - This refers to hypothetical AI systems with self-awareness and consciousness.
- **Theory of Mind:**
  - This is a more advanced form of AI that can understand human emotions, beliefs, intentions, and thoughts.
- **General AI (Strong AI):**
  - General AI systems can understand, learn, and apply knowledge across diverse domains.
  - They can perform any intellectual task that a human being can do.
- **Superintelligent AI:**
  - This is a theoretical AI that surpasses human intelligence in every aspect.
- **Robotics AI:**
  - AI is often integrated into robots to enable them to perceive, learn, and interact with the environment.

Survey 3

- AI will one day rival and may even surpass human intelligence
  - Yes, definitely
  - Not sure
  - Never

Artificial Intelligence – Should We Be Concerned?

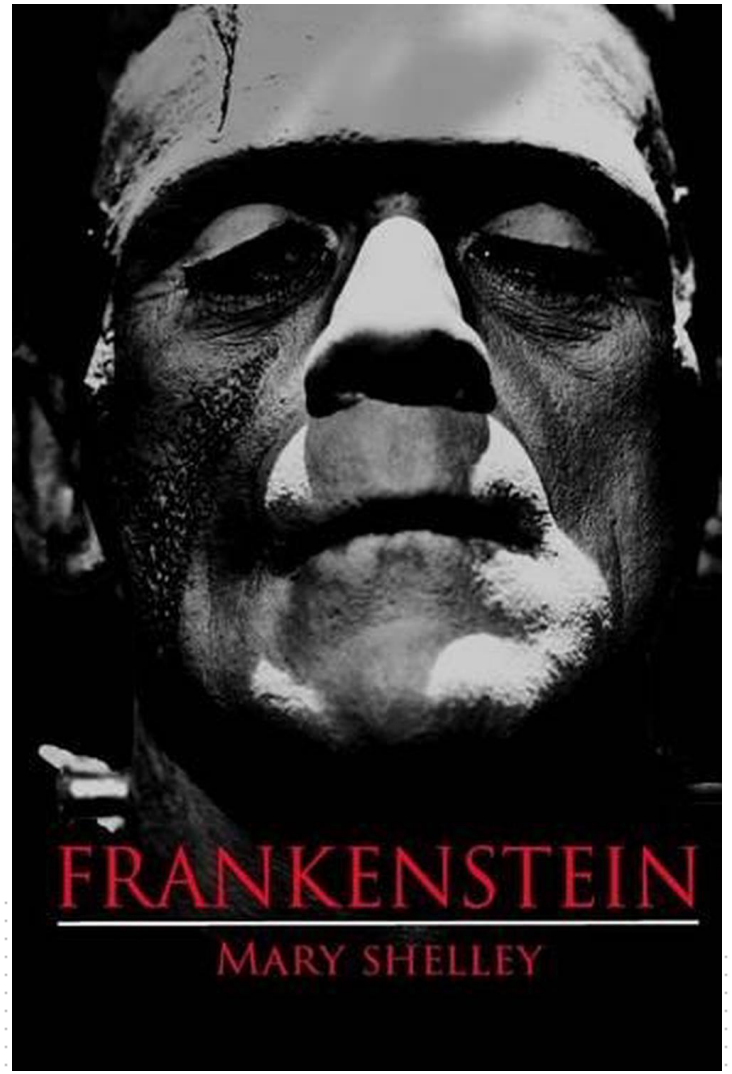
"It's likely that machines will be smarter than us before the end of the century—not just at chess or trivia questions but at just about everything, from mathematics and engineering to science and medicine." –Gary Marcus

"I am in the camp that is concerned about super intelligence." –Bill Gates

"You want to know how super-intelligent cyborgs might treat ordinary flesh-and-blood humans? Better start by investigating how humans treat their less intelligent animal cousins. It's not a perfect analogy, of course, but it is the best archetype we can actually observe rather than just imagine." –Yuval Noah Harari

"It's not artificial intelligence I'm worried about, it's human stupidity." –Neil Jacobstein

Artificial Intelligence – Should We Be Concerned?



"Nothing is so painful to the human mind as a great and sudden change."

– Mary Wollstonecraft Shelley, Frankenstein

"Beware; for I am fearless, and therefore powerful."

– Mary Shelley, Frankenstein

"Man," I cried, "how ignorant art thou in thy pride of wisdom!"

– Mary Shelley, Frankenstein

"If I cannot inspire love, I will cause fear!"

– Mary Shelley, Frankenstein

Fundamental Premise of Strong AI

Prevalent Metaphysical Assumption

- Human intelligence is reduced to a set of self-evolving survival algorithms and subroutines running on top of chemo-electric (carbon based) pathways in human brain
- Similarly, Strong AI is a set of self-evolving survival algorithms and subroutines running on top of electric (silicon based) pathways in silicon brain
- Thus, with sufficient complexity AI can rival human intelligence
- Therefore, AI will evolve on its own, surpass human intelligence and may eventually eradicate human beings

Is AI Actually Intelligence?

Alternative Metaphysical Assumption

- Human intelligence cannot be reduced to a set of subroutines in the human brain
- The fundamental piece that characterizes us as intelligent agents (self-awareness) is beyond our grasp and likely resides beyond the boundaries of natural science
- Our brain is simply a sophisticated, albeit necessary, quantum interface binding human agency to the natural world: an autonomous car still needs a driver/director to achieve set goals!
- AI cannot become self-aware; it cannot think on its own; it cannot experience feelings or emotions
- AI cannot create something genuinely new; it can only present an illusion of creation by presenting interesting permutation/recombination of what was already created by human intelligence
- AI cannot initiate an agency-based (free will) chain of events, its actions are based on either pre-determined fixed rules or purely random triggers

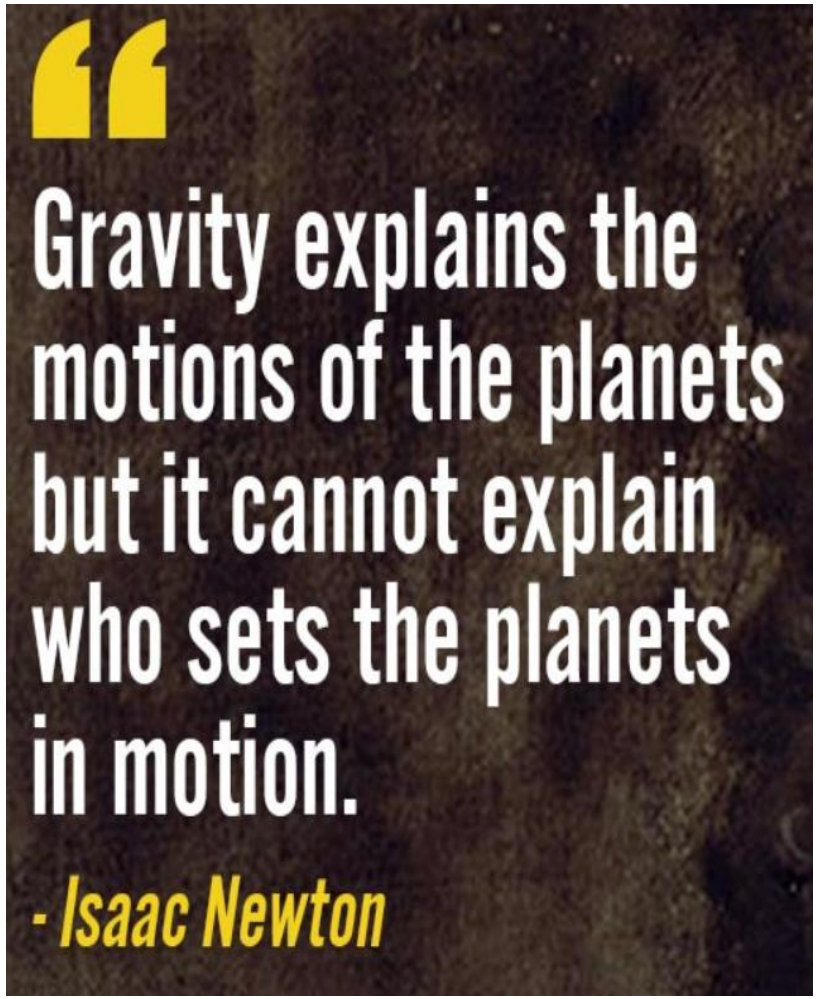
> “I am superior, sir, in many ways, but I would gladly give it up to be human.
>
> – ***Lt. Cmdr. Data***
>
> Star Trek: The Next Generation, ‘Encounter at Farpoint’.

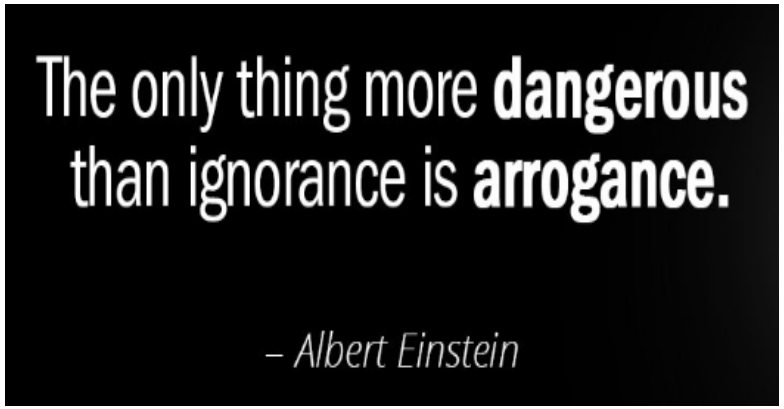
The True Dangers of AI

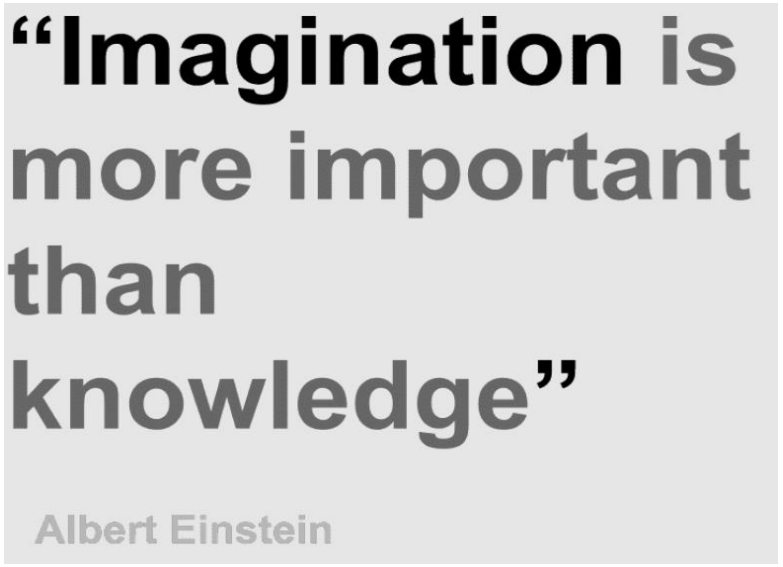
- Giving control over various aspects of our daily lives to AI may create a **bureaucratic quagmire** surpassing everything we have experienced before (automated tech support, medical clearance, security clearance, hackers, identity theft, deep fakes, slander, etc.)

- Humanization/Deification of AI creates very tempting possibilities for a small group of individuals or governing entities **to control** entire societies to achieve their pernicious agendas (propaganda, political and social control, cyber tyranny, the brave new world)

Great Quotes of Old







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Q&A

Upcoming In-Person Events

Dates and Location in the US

- Rosemont, IL – June 18th
- Columbus, OH – August 15th
- Dallas, TX – September 10th
- Anaheim, CA – October 10th

Minitab EXCHANGE

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You have data. We have solutions. Imagine the possibilities.

At Minitab, we help customers around the world leverage the power of data analysis to gain insights and make a significant impact on their organizations. By unlocking the value of data, Minitab enables organizations to improve performance, develop life changing innovations and meet their commitments of delivering high quality products and services and outstanding customer satisfaction.

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thank you

Gracias	ευχαριστώ	Danke	Grazie	благодаря
Hvala	Obrigado	Kiitos	شكراً	Tak
Ahsante	Teşekkürler	متشكرم	Salamat Po	감사합니다
Cám ơn	شكريه	Terima Kasih	Dank u Wel	Děkuji
நன்றி	Köszönöm	ありがとうございます	ขอบคุณครับ	Dziękuję
谢谢	Tack	Mulţumesc	спасибо	Merci
תודה	多謝晒	дякую	Ďakujem	