Air Canada

AI Labs

AGIFORS - May 4th, 2021

Crystal Ball 2.0 for passenger demand

Leveraging AI to power the calibration workflow

Caroline Dietrich, Air Canada
Neda Etebarialamdari, IVADO Labs
Peter Wilson, Air Canada

Copyright © by Air Canada
Published by AGIFORS with permission

IVADO LABS AIR CANADA

CRYSTAL AI

BIOGRAPHY

Caroline Dietrich leads the *Science and Innovation* team at Air Canada. She joined the Revenue Management department 6 years ago after completing Master degrees in Aerospace Engineering and Operation Research.

Neda Etebarialamdari works as a Data Scientist for IVADO Labs. She owns a PhD in the application of mathematics in AI and has been working with Air Canada on the Crystal.AI project since its early stages.

Peter Wilson manages the *Revenue Management Advancement and Practice* team at Air Canada. He has over 10 years of experience in RM working in the airline industry.

Demand Forecast
What level of granularity?
How reliable is the forecast?
Where to start?
Which horizon should I prioritize?
Demand Analyst
Where are the opportunities?
What is the system missing?

Crystal.AI premises and motto

CRYSTAL AI

North Stars

- Practitioner buy-in
- Integration with existing systems
- Human-in-the-loop

Enabling environment

- ✓ Data driven
- ✓ Highly analytical teams
- ✓ Complex and granular, seasonal cycles and global trends
- ✓ Known opportunities
- ✓ Potential gains in workflows

World leading AI / ML Scientists

AIR CANADA × IVADO LABS

Significantly **improve forecast accuracy**

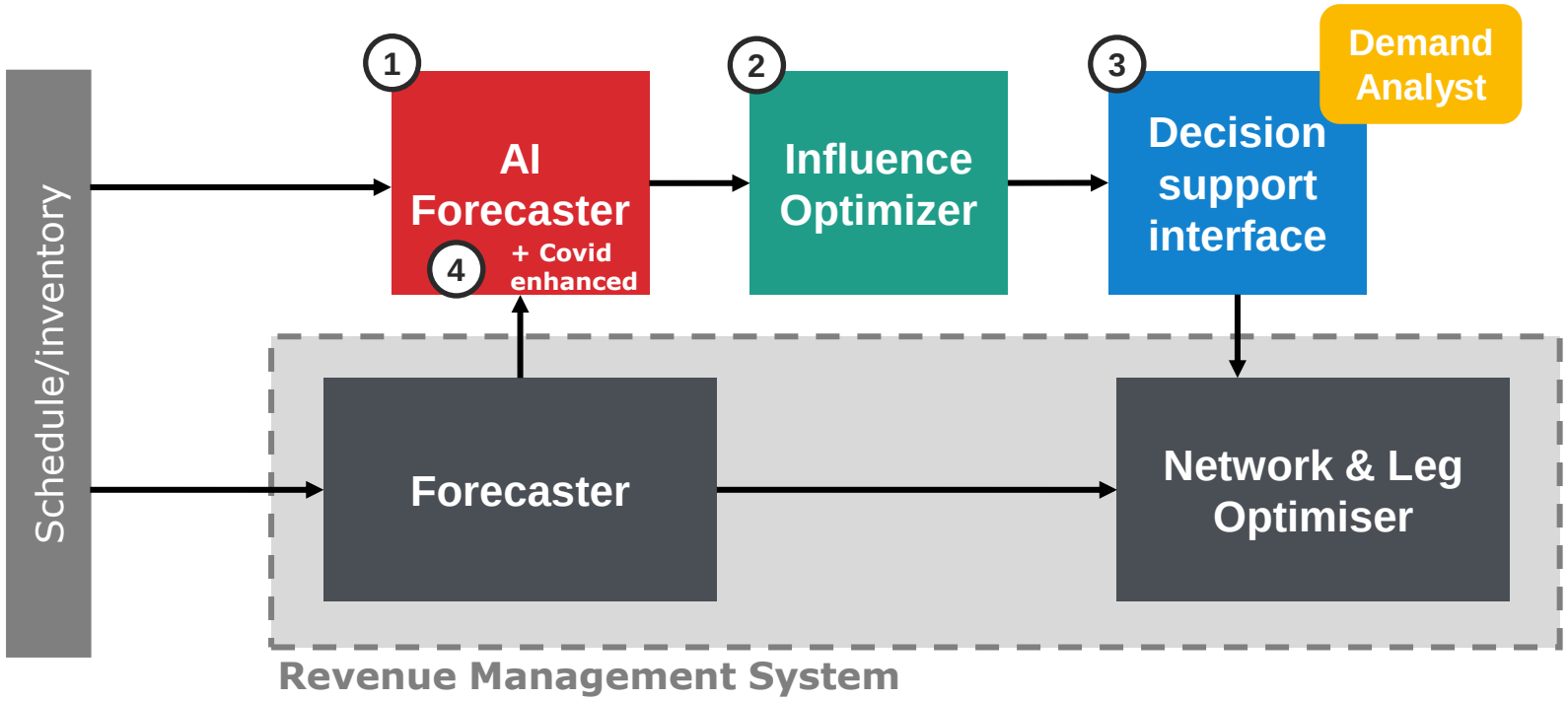
Optimize the **user workflow**

Affect our **top-line positively**

Crystal.AI end-to-end solution

Objective

To grow revenue through **improving the demand management process**; making **calibration quicker** for demand managers and **more accurate** by leveraging advanced analytics



AI models

Higher level forecast, reacts faster to new trends, added robustness

Influences optimization

Aggregates & Recommends most impactful influences

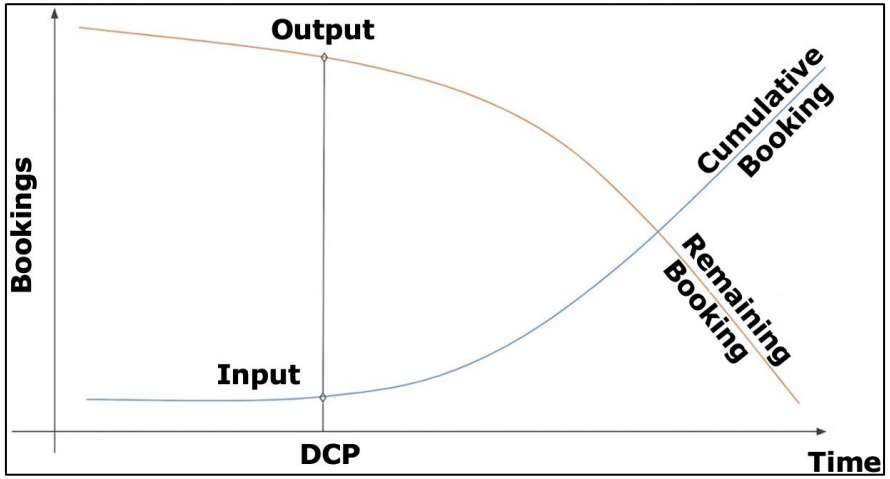
User interface

Designed with RM practitioners to assess recommendations efficiently

AI Forecaster

Problem definition

predicting the **remaining unconstrained booking to come** at each **Data Collection Point** (DCP) for a flight departing in the **next 355 days.**



Solution

Recurrent **Neural Networks** (RNN) with dual inputs, one to handle the time series data and one to handle other features

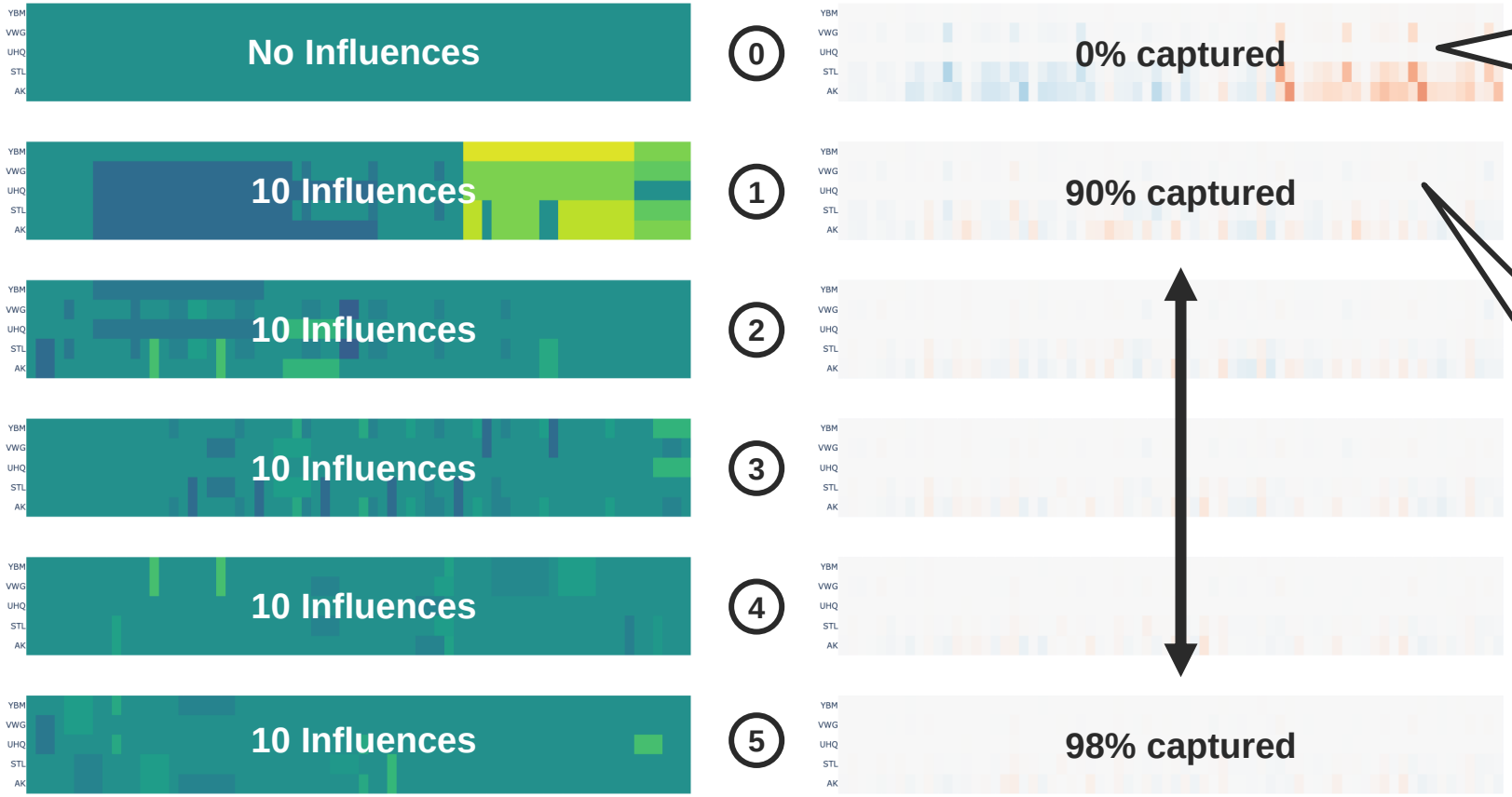
Ensemble tree-based models

Significant Results

For **pre-COVID phase**, accuracy improved by more than **25% on average across 60 OD pairs.**

Influences optimizer

Influence Optimized Bundle Set

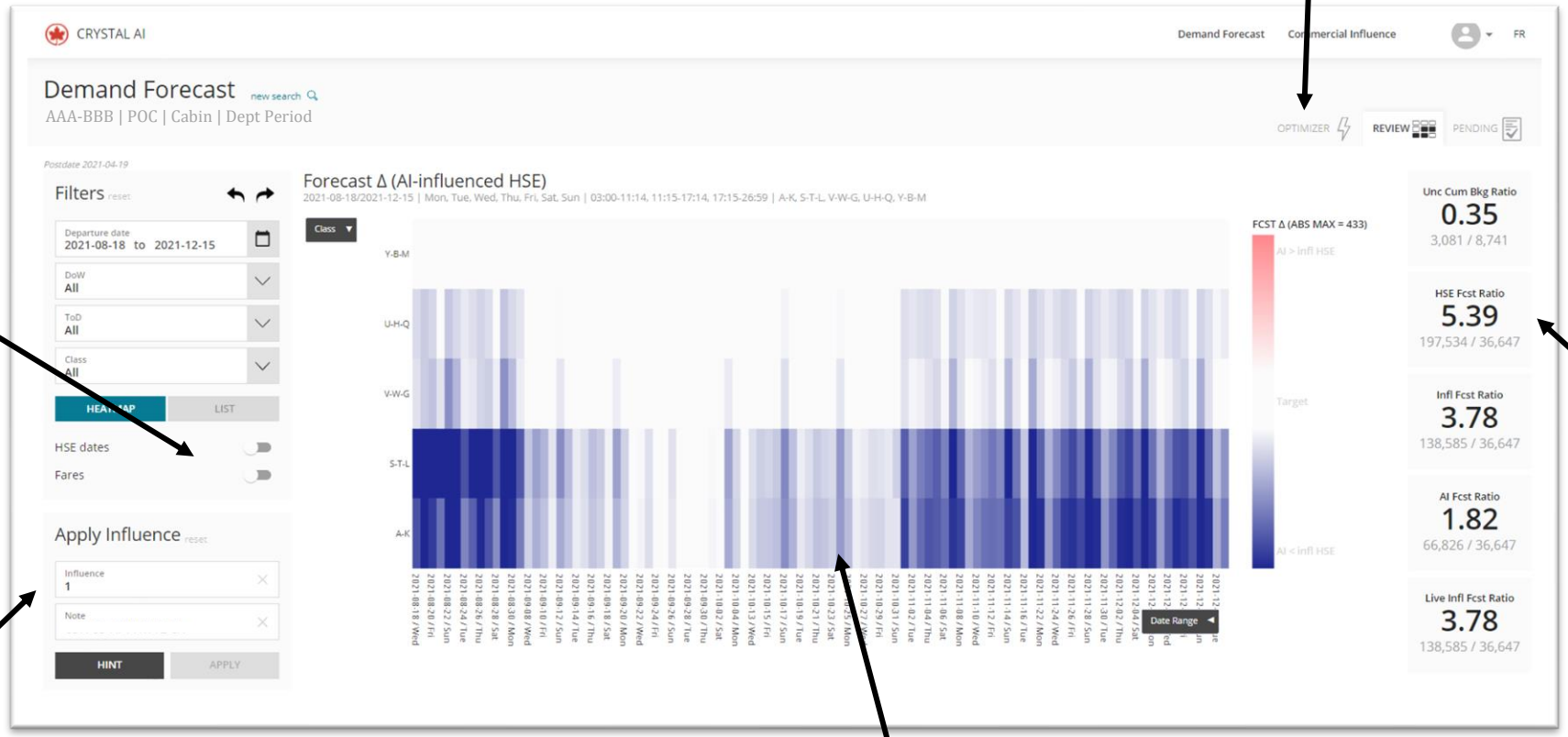


Thousands of influences are continuously **generated** to improve the accuracy of the model

The optimizer creates **bundles of influences** that can **capture 90% of the forecast improvement** with **10 unique influences**

An intuitive visual interface

List of the **influences recommended** by the optimizer



Selection of criteria helps prioritization

Key metrics to assess recommendations efficiently

Easy button and facilitated **influences creation**

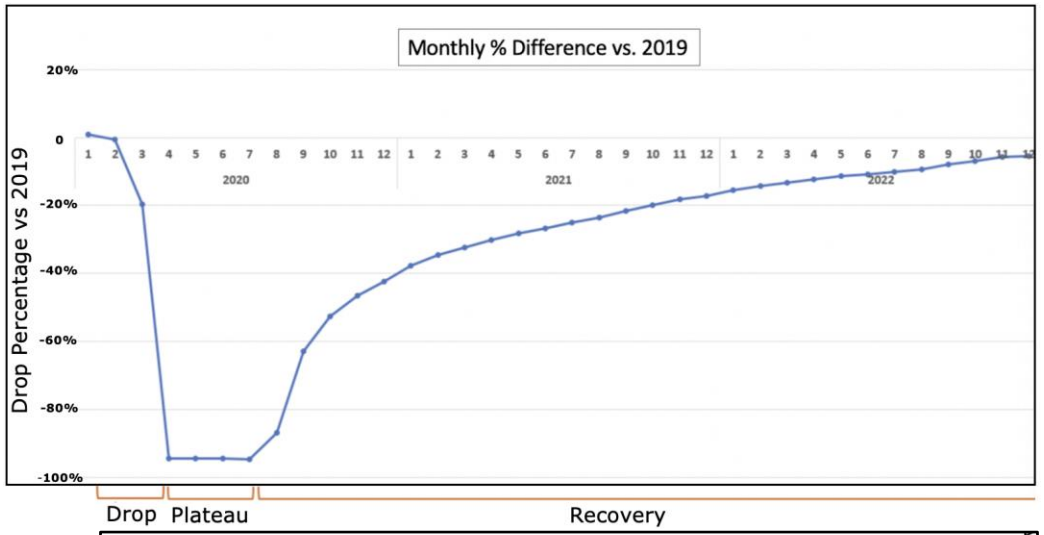
A **heatmap draws attention** to the **most value-added dimensions**

Model augmentation to Black Swan events

AI Forecaster
4 + Covid enhanced

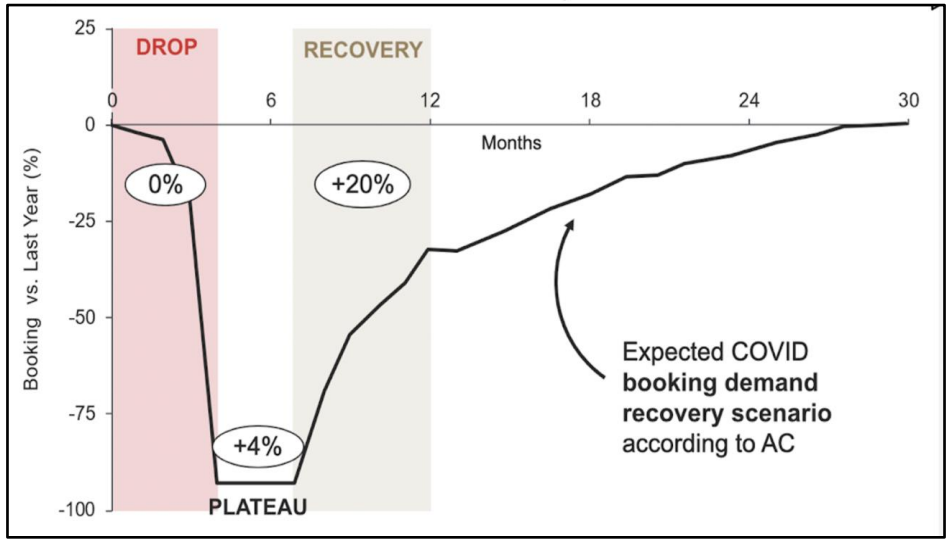
The process involves three main steps:

- **Generating synthetic data**
- **Data Augmentation:**
  adding various possible demand scenarios in the training set in order to give the model the chance to experience different probable circumstances.
- **Feature Engineering**



Experiment Roadmap:

- Train with regular **train data**, test on regular **test data**
- Train with regular **train data**, test on **synthetic data**
- Train with **augmented train data**, test on regular **test data**
- Train with **augmented train data**, test on **synthetic data**

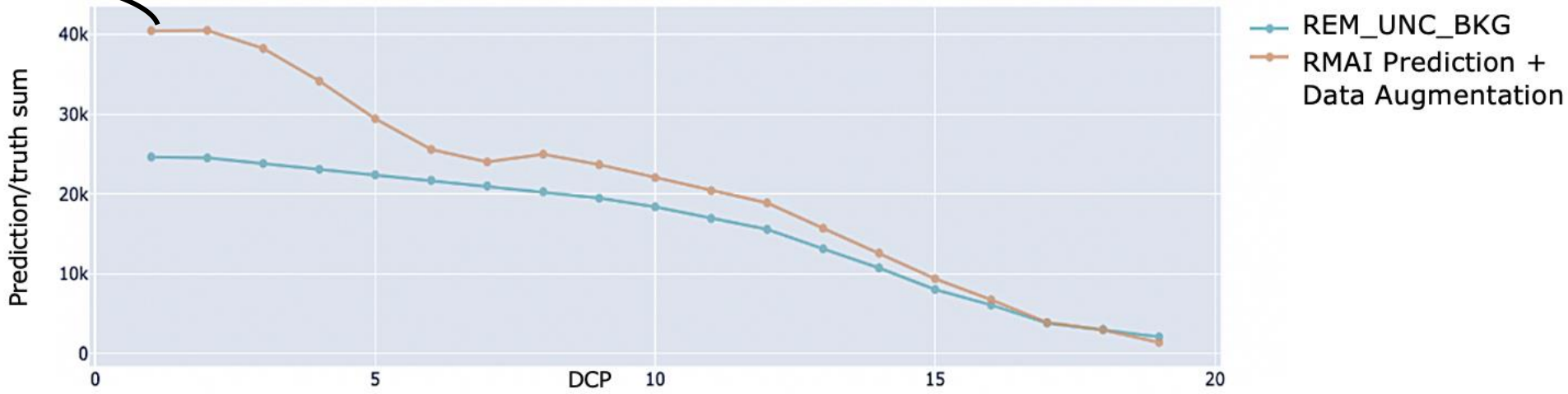


Model augmentation to Black Swan events

For flights departing in December (recovery period); an example of one origin-destination:

AI-driven prediction,
Without data augmentation

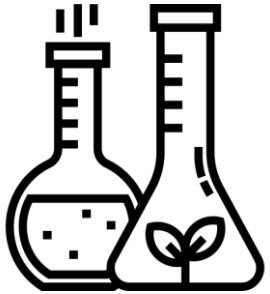
AI-driven prediction,
With data augmentation



Conclusion

- ✓ RM **users at the heart** of the development throughout
- ✓ **Ingest massive data sets** to generate forecast influences live
- ✓ **Supplement** the RM system's demand forecast
- ✓ **Recommend influences** to drive accuracy improvements
- ✓ Augmented to ensure **viability in a COVID setting**
- ✓ **Conducted user centric testing**
- ✓ **Develop a methodology** to measure the **Revenue Impact** of the project
- ✓ **Successfully implemented** on a significant portion of our network

Involve users early



Experiment & iterate

Implemented widely

Thank you!

Merci !

aircanada.com