The endless line

LEVERAGING THE USE OF AI TO ENHANCE CONSUMER SATISFACTION AT EURO-PARK

eleven × ÉCOLE NATIONALE DES PONTS ET CHAUSSÉES | INSTITUT POLYTECHNIQUE DE PARIS

Predicting queues under uncertainty

CONTEXT & OBJECTIVES

50% Average percentage of a visitor's day spent in waiting lines

¾ Proportion of French travellers reporting waiting time as a systemic friction in amusement parks

30' Average time spent in queues for each headliner attraction at Euro Park

- Revenue leakage from non-monetized queue time
- Capacity misallocation
- Decreased visitor satisfaction
- Incomplete guest experience

Success KPIs :

Model : RMSE between predicted waiting time and real time.

Business:

- Minutes saved per guest
- Extra rides per guest
- € spend per hour uplift
- NPS & complaints
- Downtime minutes.

Objective : Forecast **wait time at T+120 min** for each **ride × 15-min slot** to steer **demand + capacity** in real time

Turning raw data into model ready features

FEATURE ENGINEERING

Creating new pertinent features from raw metrics

FEATURE ENGINEERING

Business driver	Observable signal	Engineered features	Expected outcome on waiting time +2h
Guest demand cycles	Hour, day-of-week, month	sin/cos of hour, day, month weekend, opening peak, lunch, dinner, closing peak	Peaks in affluence at opening, lunch and dinner. Higher number of visitors on the weekends
System pressure	All rides current waits	park-wide capacity, mean, median, std of waiting time, ride shares of capacity	High mean / std : congestion persists High rank per ride : risk of spillover or future congestion
Operational constraints	Capacity, downtime	Capacity, downtime flag	Low capacity, recent downtime : forecasts longer future waits
Exogenous shocks	Weather, events	Rain, snow, time to parade 1, time to night show. Temp < 10°C, wind > 8mph	Rain, wind and snow can suppress outdoor rides Pre-parade surges

Scaling each set of features with StandardScaler method (Standardization + min/max scaling)

Dealing with sparse features by replacing missing values by 0, mean, median values

Model choice & thought process

Powered by XGBoost

- Predictions are made in 5-minute intervals, with few observations between 85 and 155 minutes.
- The variable is discrete but ordered and nearly continuous, making it naturally well-suited for regression.
- XGBoost provides greater flexibility than a strict classification into fixed categories.
- The model remains robust despite the limited data for longer durations and reduces the risk of overfitting.
- It combines accuracy and stability, ensuring reliable predictions even for rare values.

8.81 mins

Average precision on the model's waiting time 2h predictions

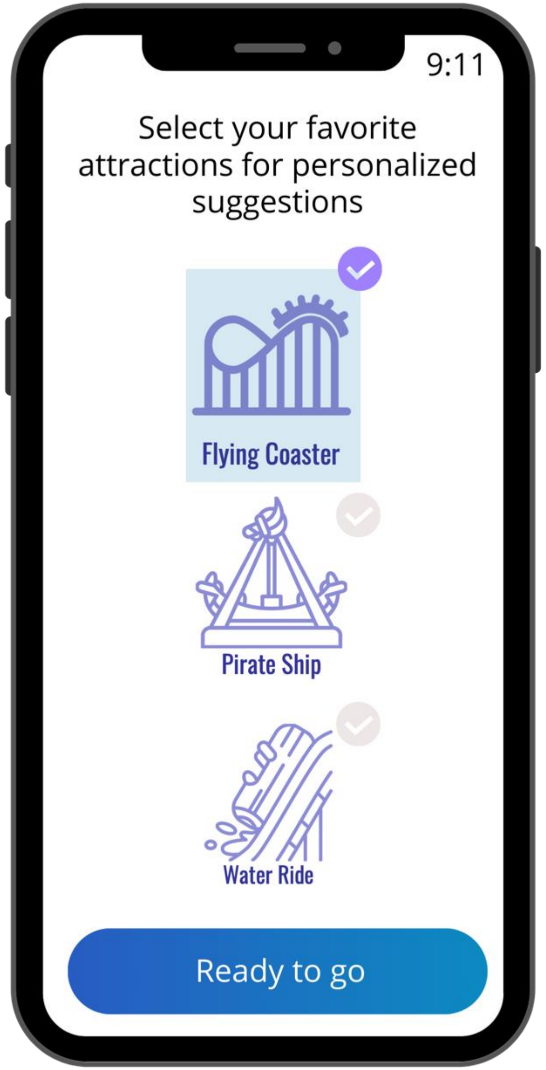
Optimizing visitor flow – *the next steps*

OUR SOLUTION TO CONGESTION ENHANCED BY MACHINE LEARNING: **FLOW INDICATION PANELS**

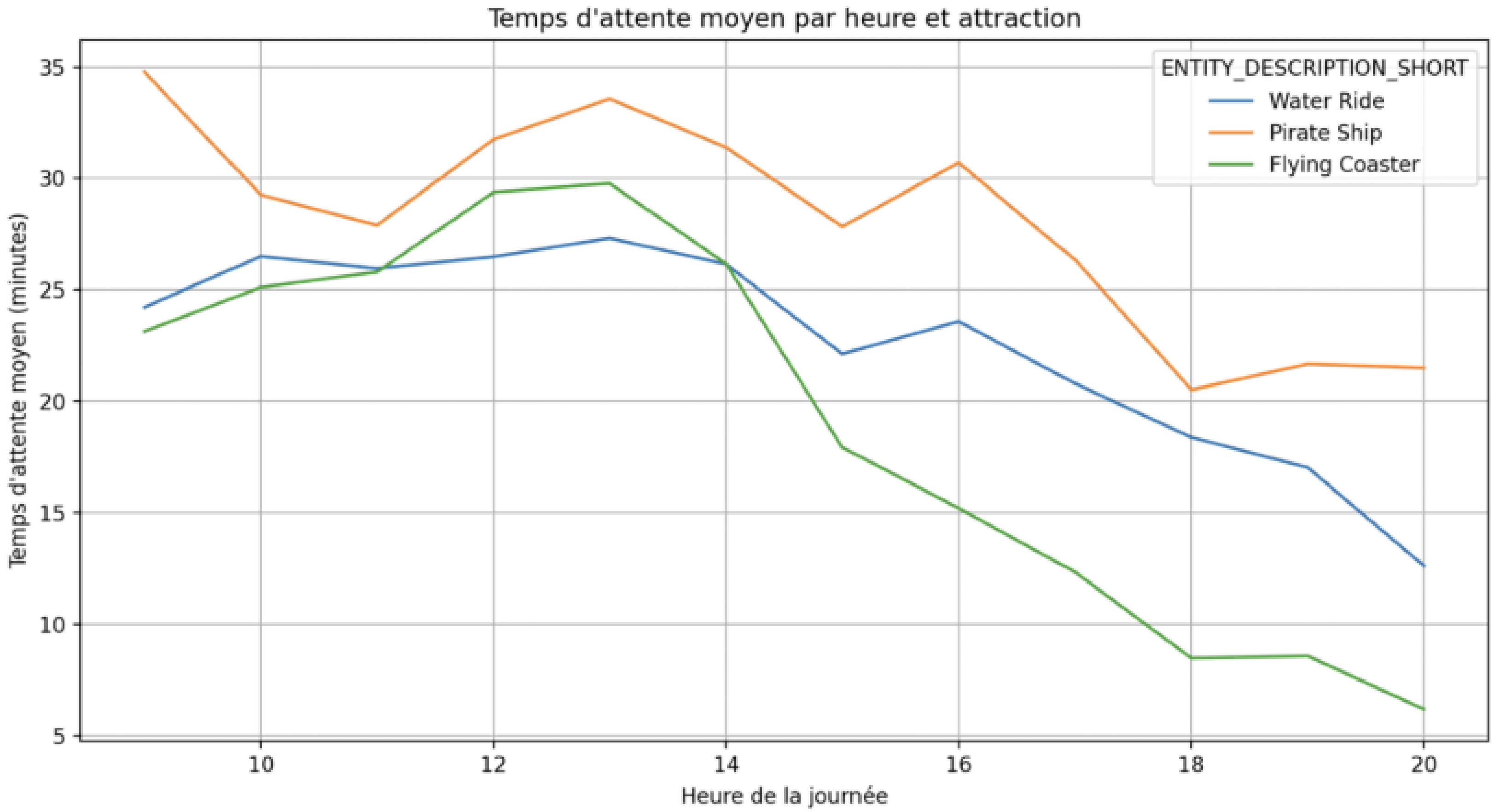
Turning T+2h waiting forecasts into concrete actions

Enhancing customer experience and focus the park teams on the crowd

LESS WAITING
MORE **RIDING**,



Select the attractions you want to ride within the day > receive an all-day guidance to enhance your journey through the park and reduce your waiting time



Prospected impact and business perspectives

Prospected impact :

- 12 M guests per year
- Average wait per guest of 200 mins
- 10‰ reduction in waiting time (-20mins / guest)
- 4 M waiting hours saved
- Average 12 mins per ride

20M

Extra rides per year

Invisible orchestration : Preserving autonomy of the user vs prescriptive routing
Shorter waits = better day: measurable reduction in peak queues, higher CSAT/NPS.
Personal : recommendations by ride, time, weather
Fairness & flow: balance loads without penalizing any group
Seamless by design (existing app, signage, and ops dashboards)

Low incremental cost: reuses current data and app

– Time → + spend: less queuing translates to more F&B/retail and extra experiences.

Trust through accuracy: posted vs. actual waits within a ±30% band.

From endless lines to seamless journeys

DEPLOYMENT ROADMAP

Pilot test: deploy queue prediction in 1–2 high-demand attractions

m + 0

m + 1

Integrate within app: push notifications + flow guidance

Measure KPIs: minutes saved, rides per guest

m + 4

Scale park-wide if results confirm