



15-17 MAY
MONTREAL 2017
 GLOBAL PUBLIC
 TRANSPORT SUMMIT



HOW CAN HISTORY-BASED PREDICTIONS IMPROVE SERVICE QUALITY?

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In collaboration with



#UITP2017

Supporting organisations



Local Hosts



TRAPEZE SWITZERLAND GMBH



AVLC Solutions



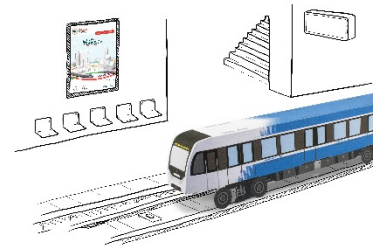
Passenger Information



Ticketing

Trapeze Figures

- 2,000 customers – public and private transport companies
- Active in more than 20 countries worldwide
- Over 40 years of AVLC experience
- Trapeze Switzerland GmbH, European headquarter

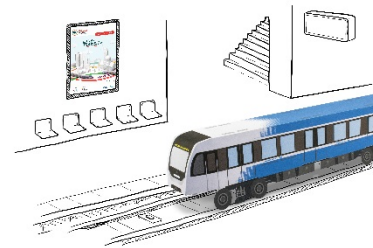


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QUESTIONS / MOTIVATION

WHAT METHODS EXIST FOR ARRIVAL / DEPARTURE PREDICTIONS IN AN AVL SOLUTION?

- Can history-based predictions improve service quality?
- How can history-based predictions improve service quality?



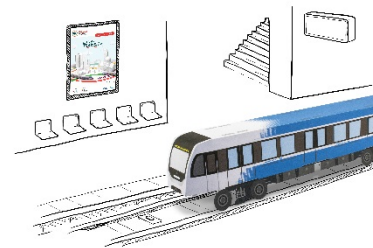
WHY CALCULATE ARRIVAL PREDICTIONS?

Real-Time Information

- Better quality of decision-making by dispatchers
- Increased traveller satisfaction through better information
Wait-time at the stop is perceived as shorter and can be productively used

Basis for Advanced Functionality

- Door-to-door travel assistance
- More efficient transfer protection
Incidental transfers can be detected earlier, transfers can be broken earlier



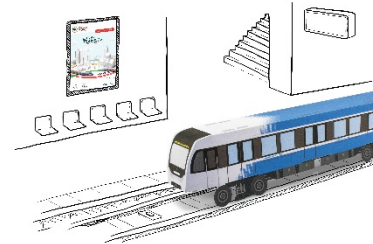
SCHEDULE-BASED PREDICTION

Algorithm

- Basic assumption:
A vehicle will keep its schedule deviation throughout its journey
- Optimisations:
 - If behind schedule and scheduled dwell time > 1 min: catch up some delay at that stop
 - If ahead of schedule: depart on-schedule at next stop (unless marked «do not dwell»)

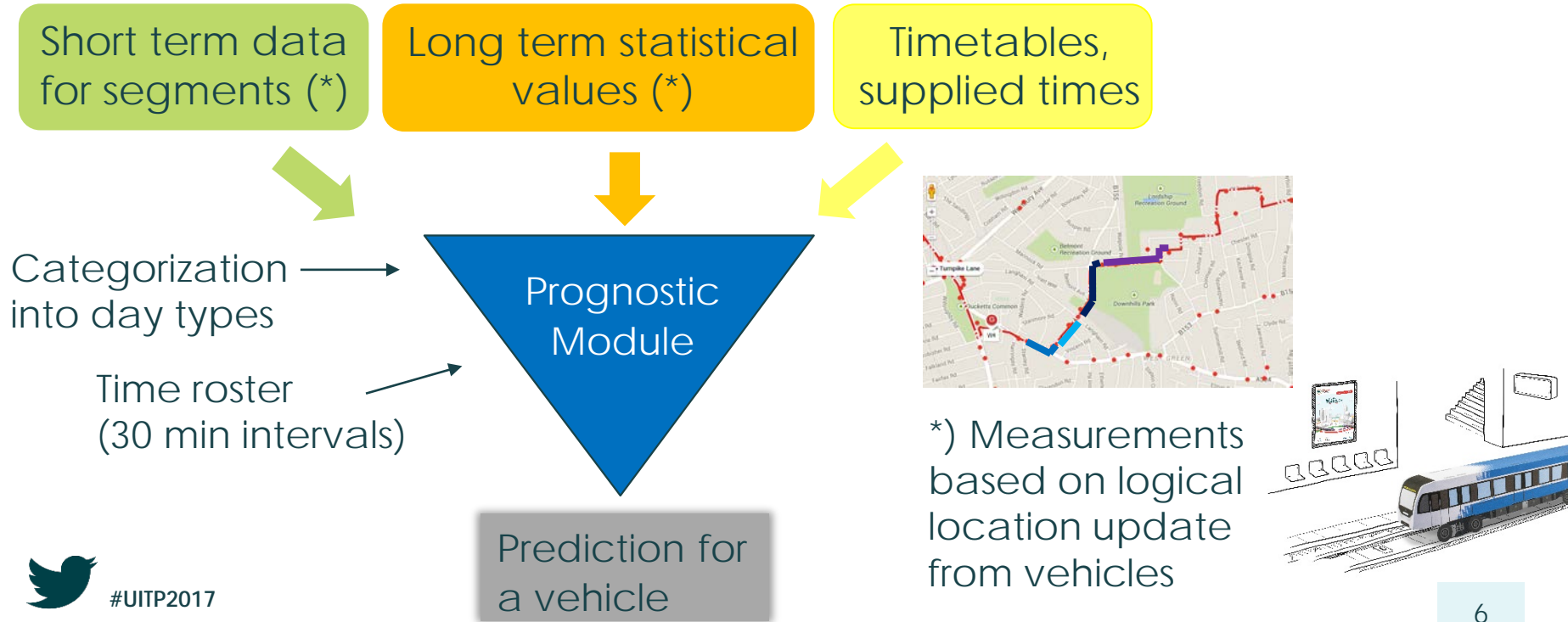
Properties

- Works well if schedules have been carefully optimised to expected traffic and passenger load conditions for day types and time-of-day bands
- Works well if vehicles are generally not in congestion (rural areas, bus lanes)



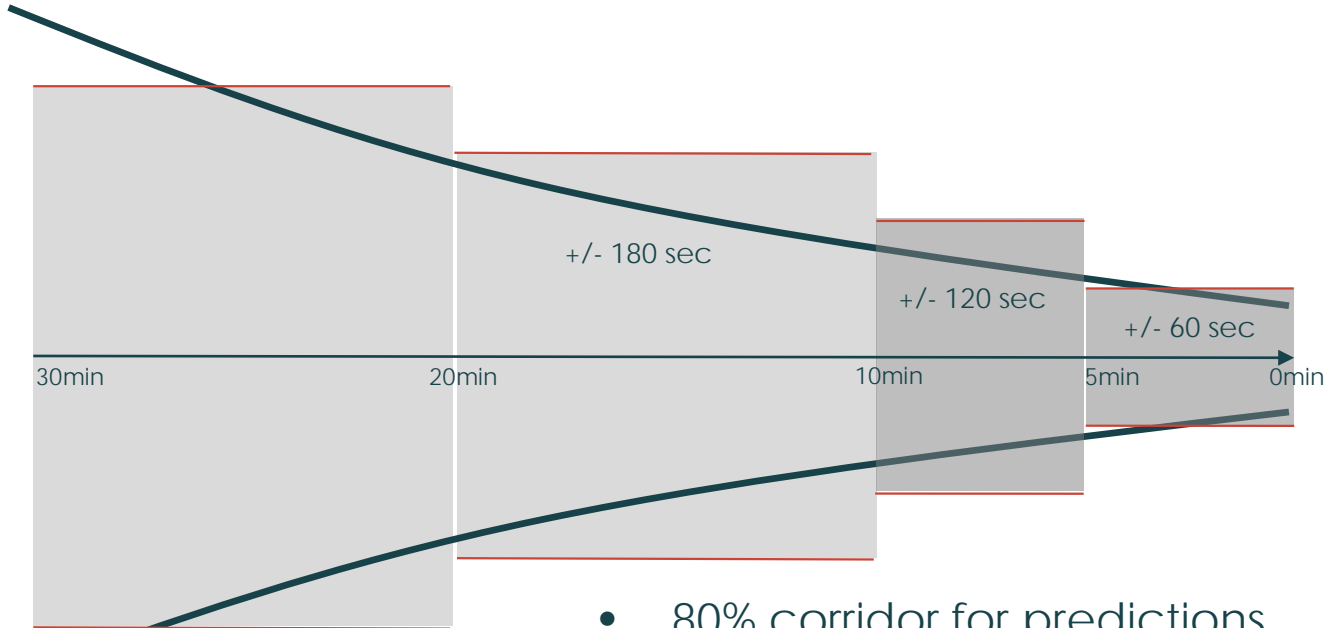
HISTORY-BASED PREDICTION

SELF LEARNING SYSTEM

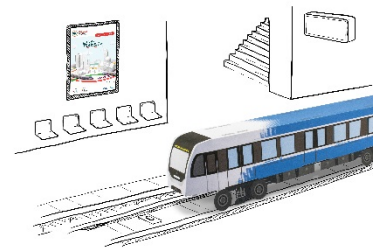


TIME BANDS FOR MEASURING QUALITY

WHICH PREDICTION METHOD WINS?



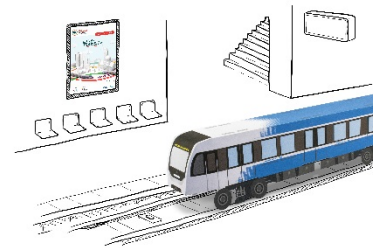
- 80% corridor for predictions
- Biggest focus on last 5 minutes



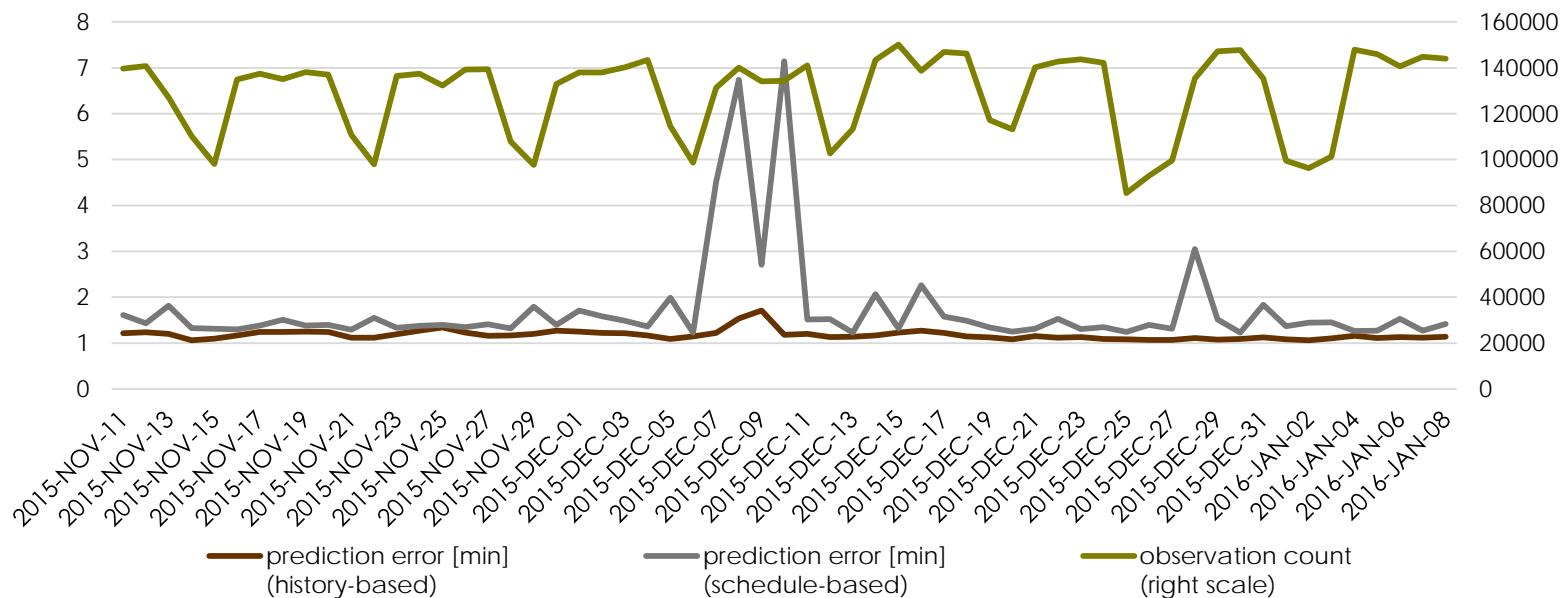
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CITY A

- Schedule is highly adapted to street traffic and passenger load situations for different day types and time-of-day bands.
- Public transport is prioritised with respect to private transport, resulting in generally good schedule adherence.



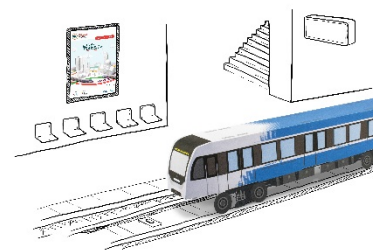
PRED. ERROR CITY A: DAY-TO-DAY



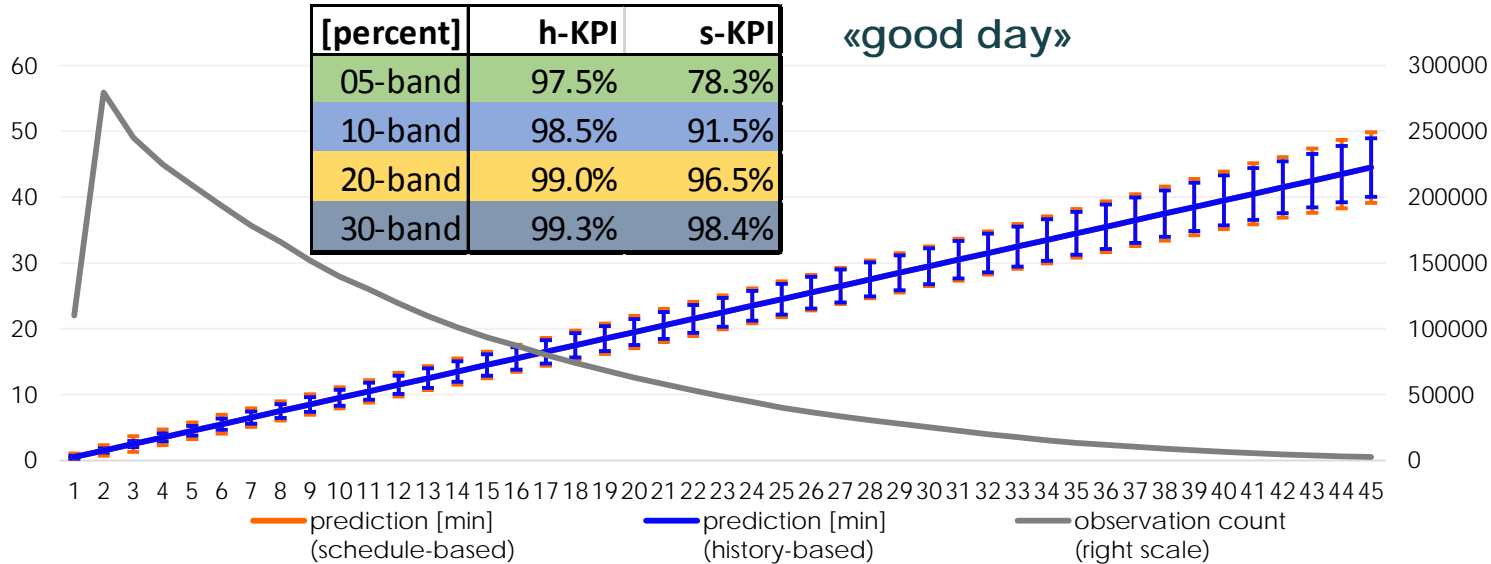
- History-based is consistently 30 seconds better than schedule-based
→ 50% of times displayed on signs would be different (better)!



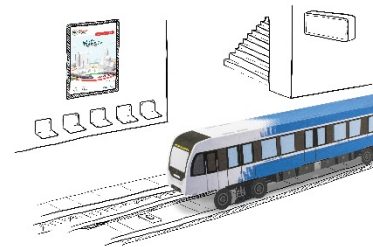
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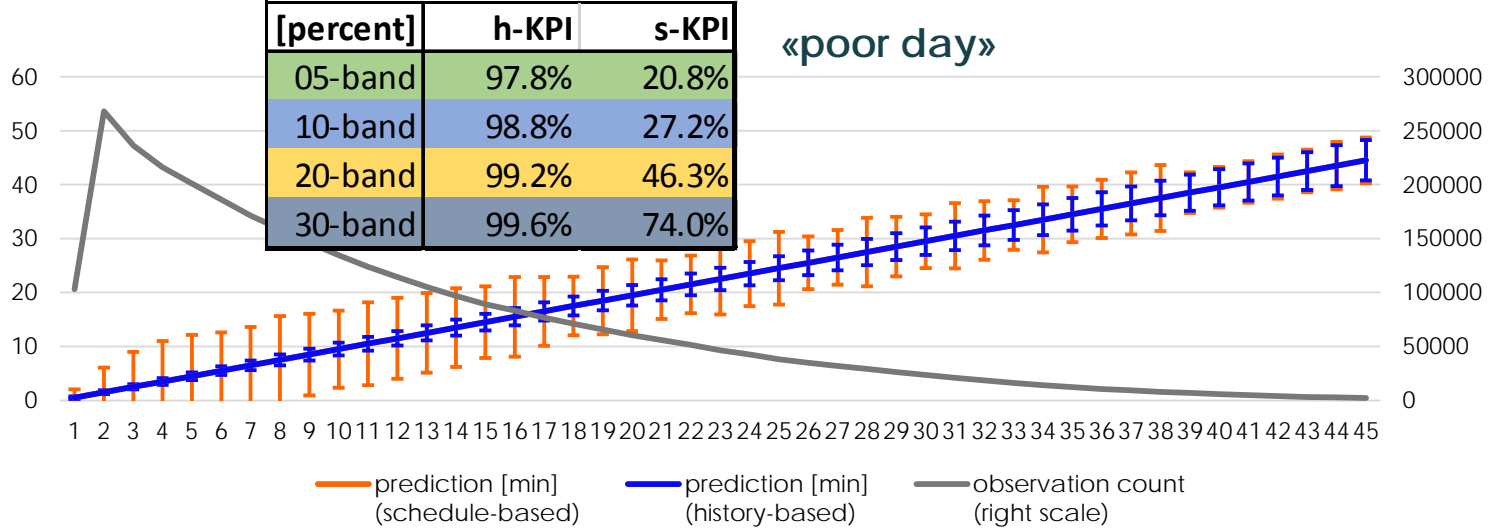
PRED. QUALITY CITY A: WED 2015-11-11



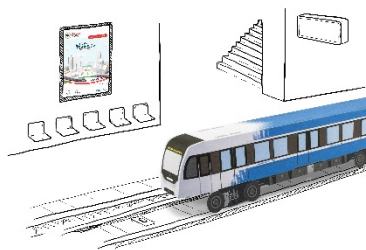
- History-based is slightly better than schedule-based
- Both methods meet the target performance of the London KPI



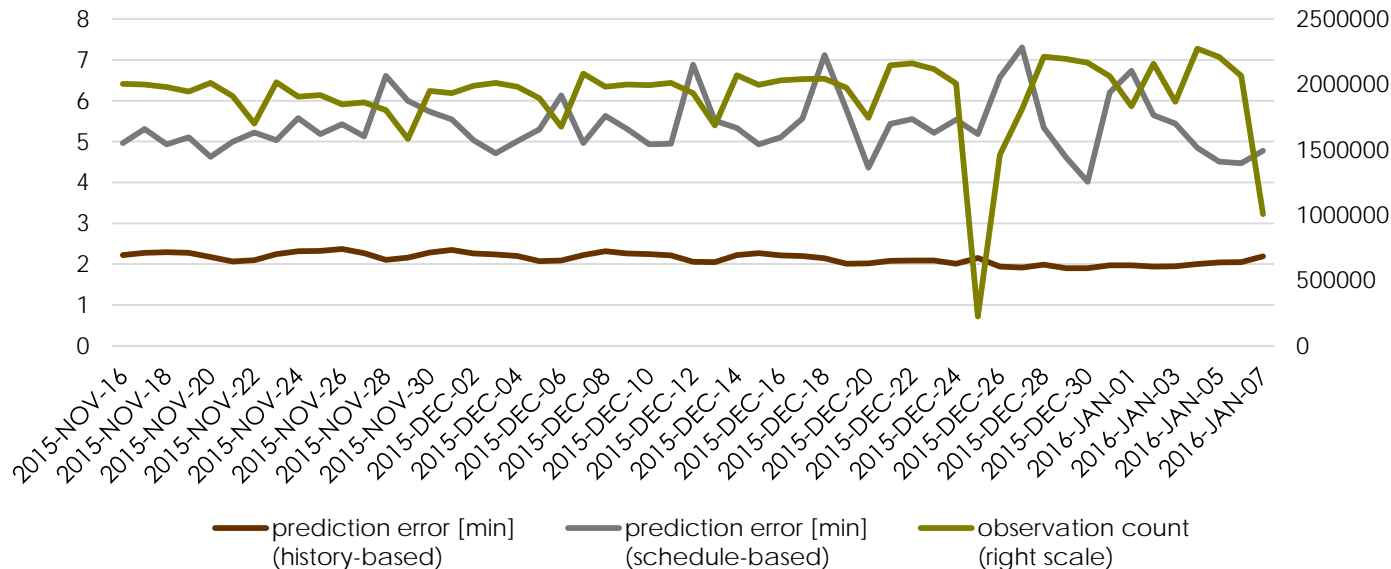
PRED. QUALITY CITY A: THU 2015-12-10



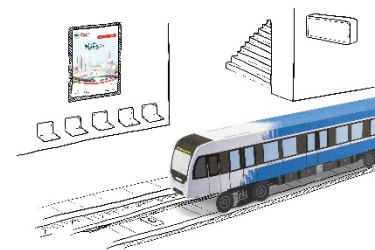
- The 80% band of schedule-based is very wide
- Only history-based meets the target performance of the London KPI



PRED. ERROR LONDON: DAY-TO-DAY

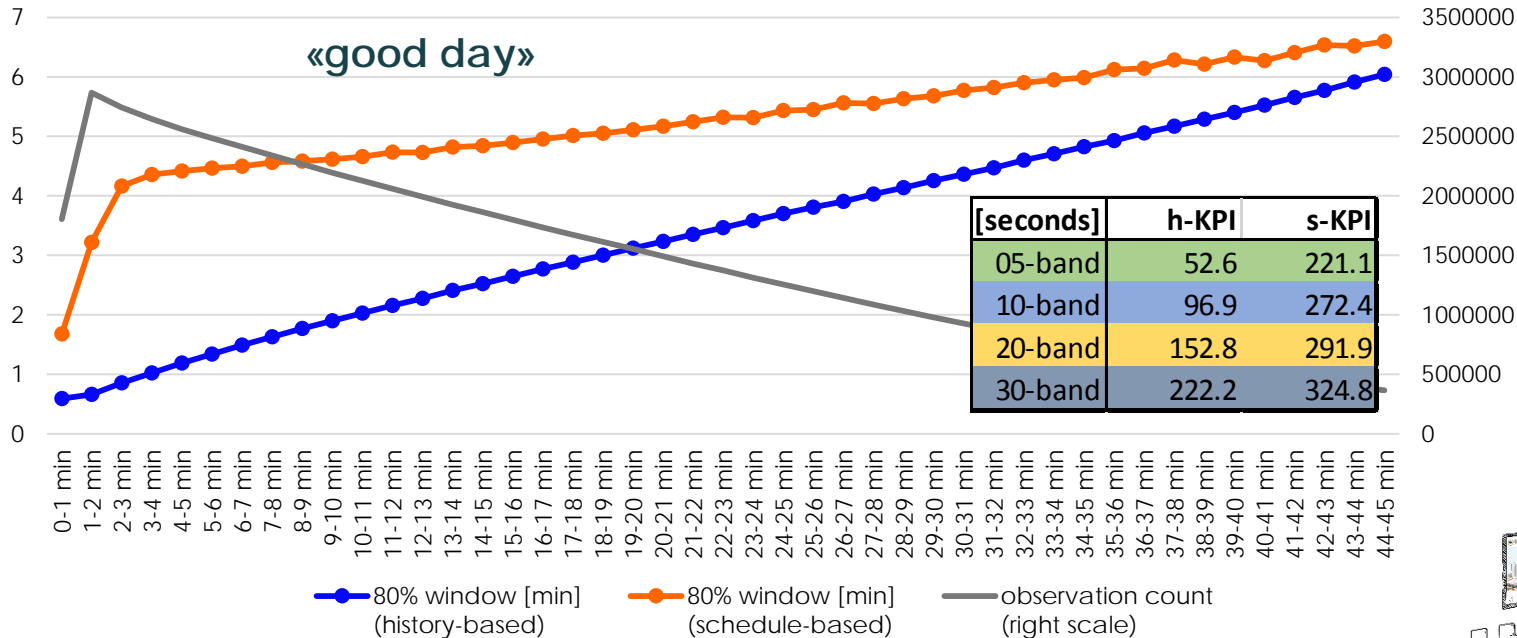


- Day-to-day of prediction error when looking 9-10 min into future
- 80% of predictions have smaller error than indicated data point

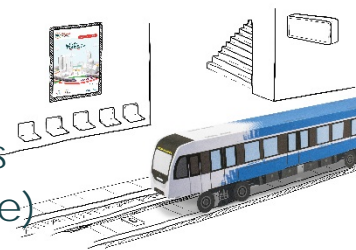


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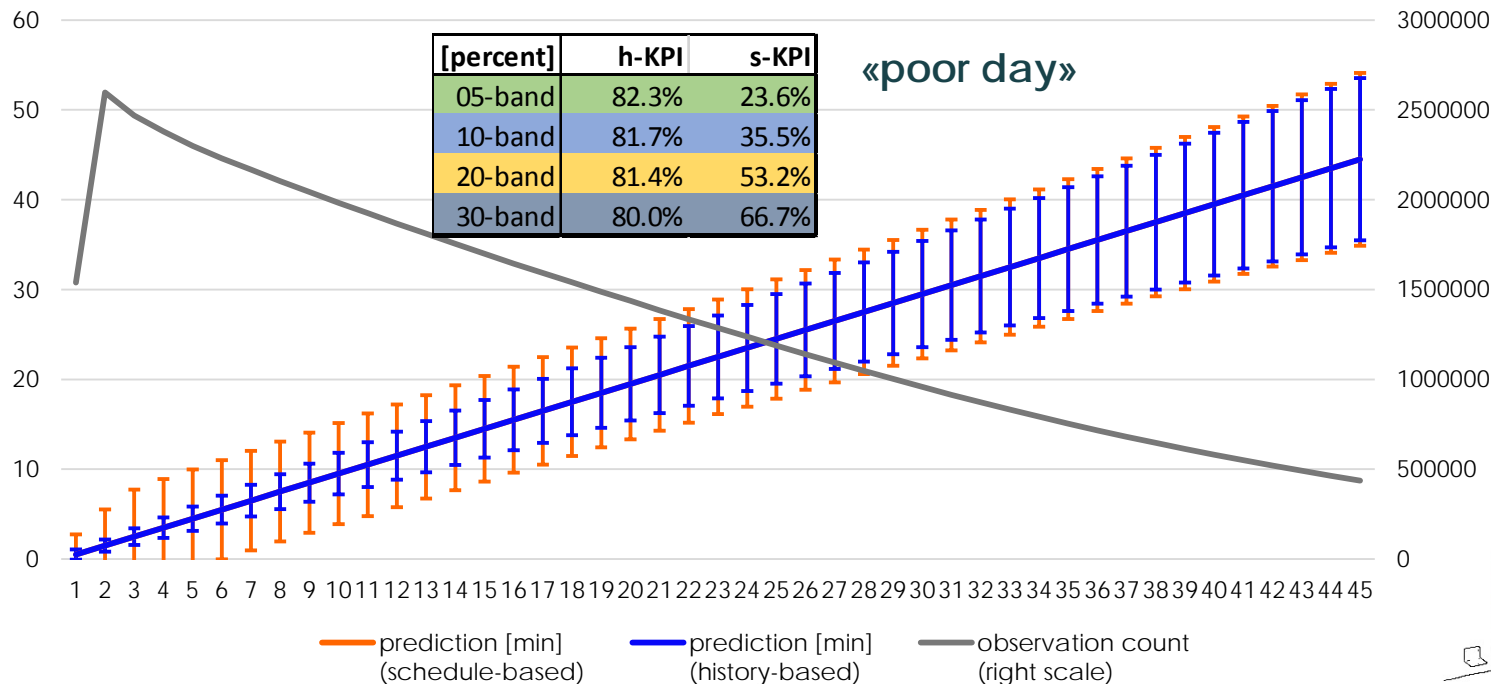
PRED. ERROR LONDON: 2015-12-29



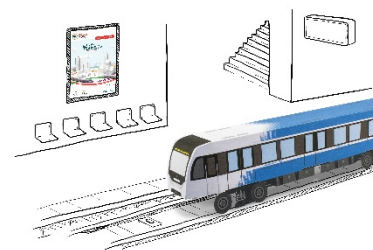
- The 80% band of schedule-based is wide, indicating that the schedule is not very well adapted to the traffic conditions (and does not need to be)



PRED. QUALITY LONDON: 2015-12-08



- History-based just meets the target performance of the London KPI



DIFFICULT SITUATIONS

Traffic light close to stop

- Problematic with or without traffic light pre-emption

Sudden blockage

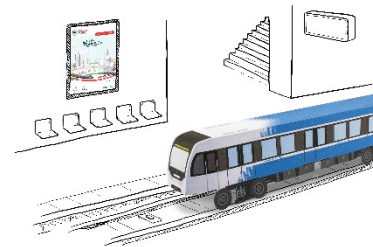
- Truck stops on street for off-loading

Short Term Construction

- Long-term history cannot be used (as well scheduled times...)

Path Dispatch

- Driver performs a path dispatch action, not using the system functionality -> no available measurements for newly driven section



SUMMARY & OUTLOOK

History based prediction outperforms the “traditional method” consistently. Arrival / departure times are more precise and improve the service quality for passengers

London uses this logic since 2007...

...what about **you**?

