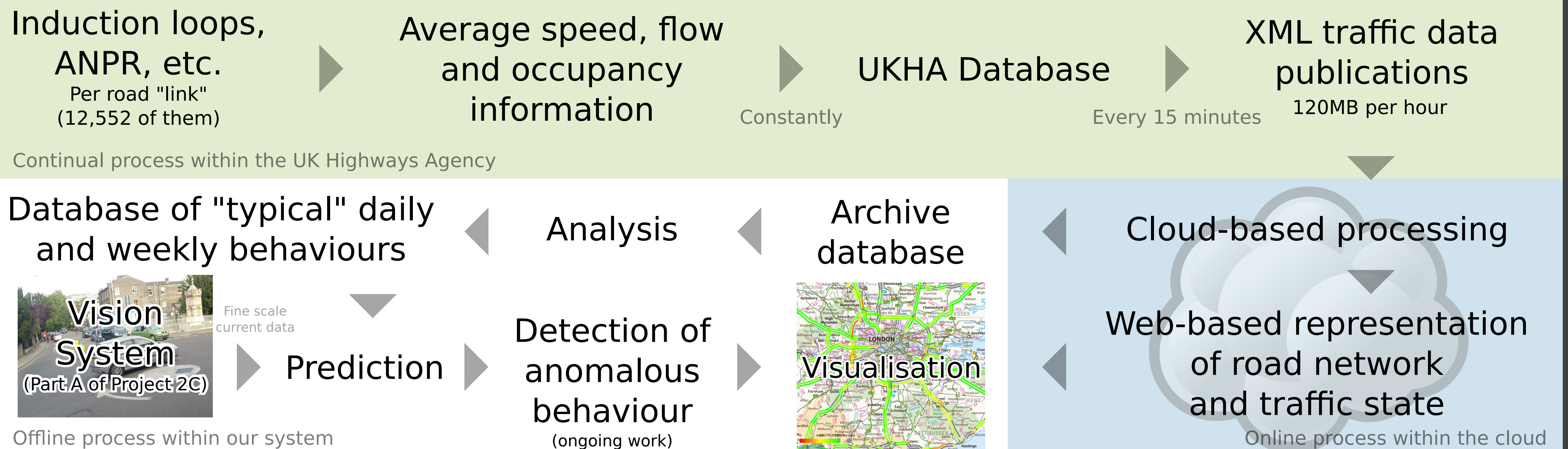# Finding Patterns and Predicting England's Traffic

Rich Wareham[1], Nick Kingsbury[1], University of Cambridge

Q: Can we predict 'usual' traffic flow across England?
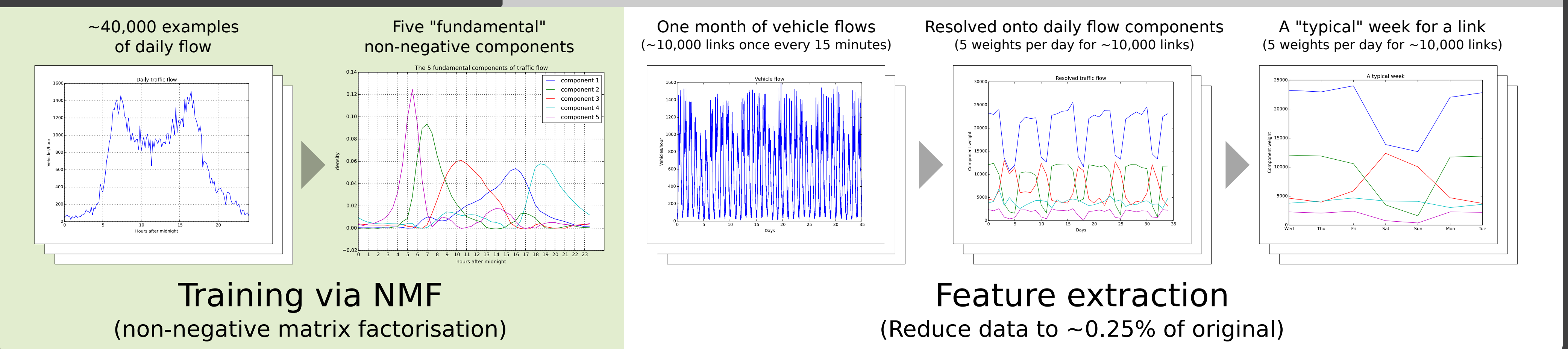
DATA PIPELINE
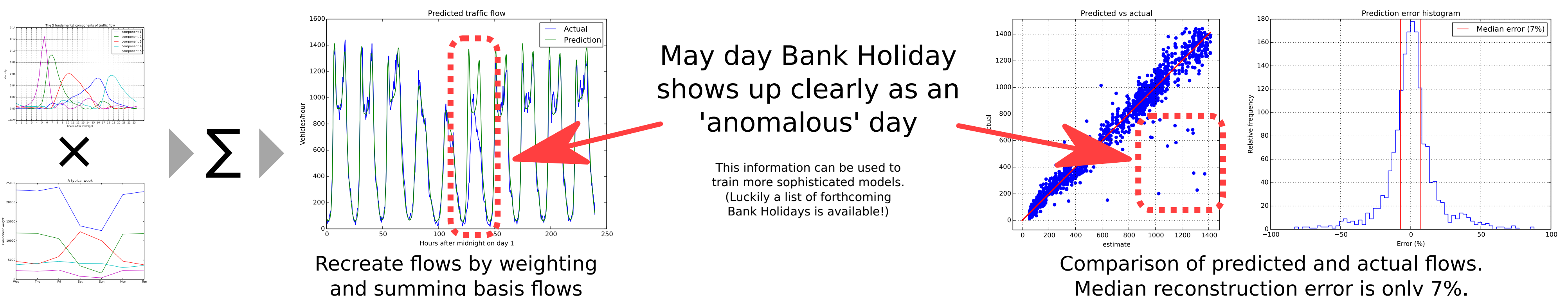Where we get our real-time data from and what we do with it.

Induction loops, ANPR, etc.
Per road "link"
(12,552 of them)

→ Average speed, flow and occupancy information

→ UKHA Database
Constantly

→ XML traffic data publications
Every 15 minutes | 120MB per hour

Continual process within the UK Highways Agency

Database of "typical" daily and weekly behaviours

← Analysis

← Archive database

← Cloud-based processing

Vision System
(Part A of Project 2C)

Fine scale current data

→ Prediction → Detection of anomalous behaviour
(ongoing work)

→ Visualisation

← Web-based representation of road network and traffic state

Offline process within our system

Online process within the cloud

ANALYSIS
Also known as: 'drinking from the fire hose'.

~40,000 examples of daily flow

Five "fundamental" non-negative components

One month of vehicle flows
(~10,000 links once every 15 minutes)

Resolved onto daily flow components
(5 weights per day for ~10,000 links)

A "typical" week for a link
(5 weights per day for ~10,000 links)

Training via NMF
(non-negative matrix factorisation)

Feature extraction
(Reduce data to ~0.25% of original)

PREDICTION
An example using a single representative link.

What happens if we predict a given link's flow using it's typical behaviour over a week as a guide?

× → Σ →

May day Bank Holiday shows up clearly as an 'anomalous' day

This information can be used to train more sophisticated models.
(Luckily a list of forthcoming Bank Holidays is available!)

Recreate flows by weighting and summing basis flows

Comparison of predicted and actual flows.
Median reconstruction error is only 7%.

A: Yes, with a median error of around 7% of the traffic flow.

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References & details: https://richwareham.com/@trafficposter2014

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