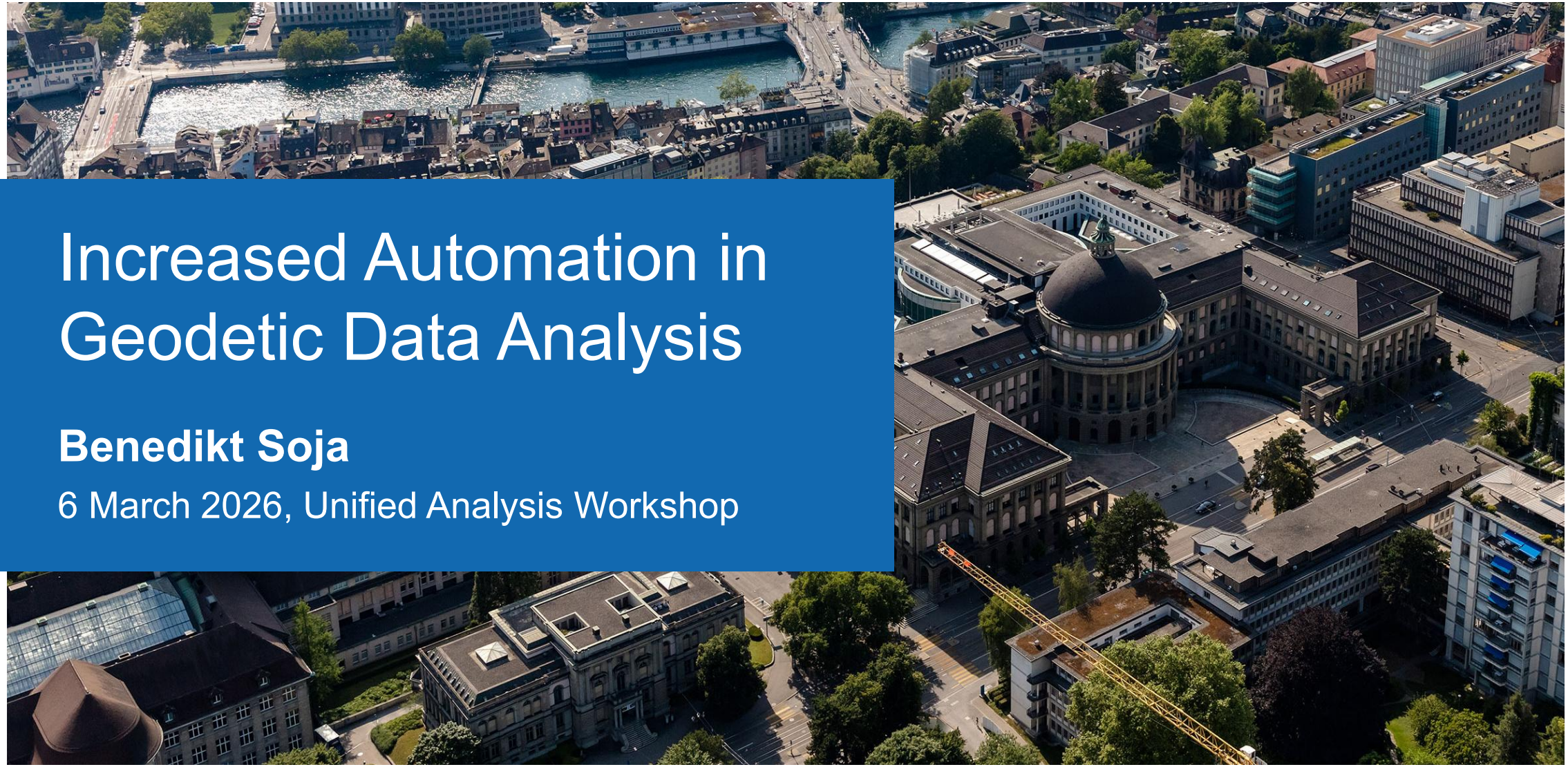
ETH zürich

SPACE GEODESY



Increased Automation in Geodetic Data Analysis

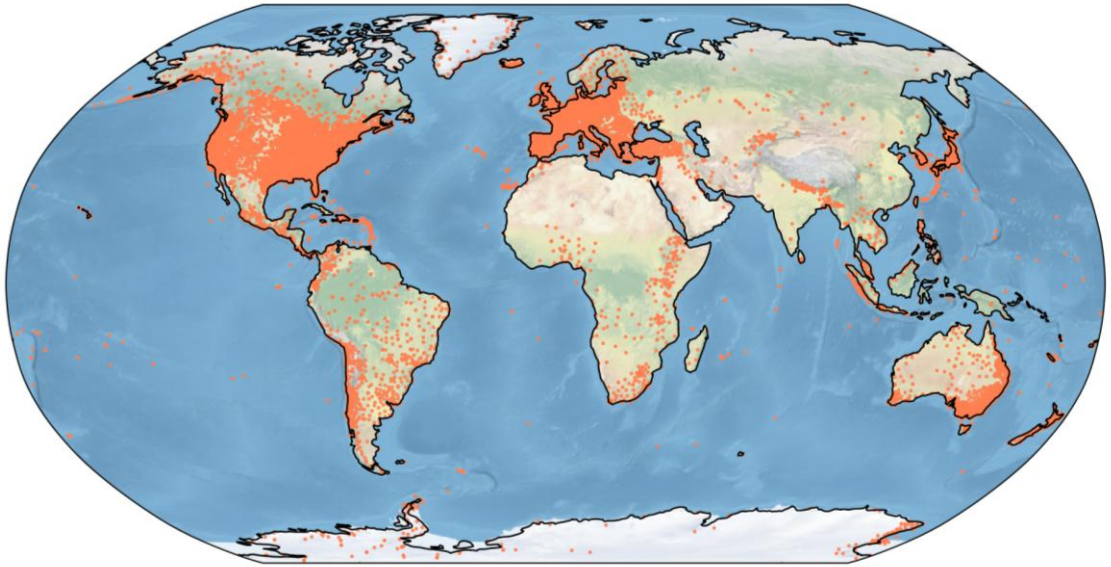
Benedikt Soja

6 March 2026, Unified Analysis Workshop

Why automation?

- **Efficiency**: reducing product latency
- **Reliability**: minimizing human error
- **Inclusivity**: enabling smaller teams to contribute

- Now more important than ever with **growing data volumes**
  - Reprocessing of data from 45+ years
  - Processing of 20k GNSS stations (NGL)



Successes and challenges

- Successes
  - Routine GNSS PPP processing
  - VLBI "Intensive" sessions

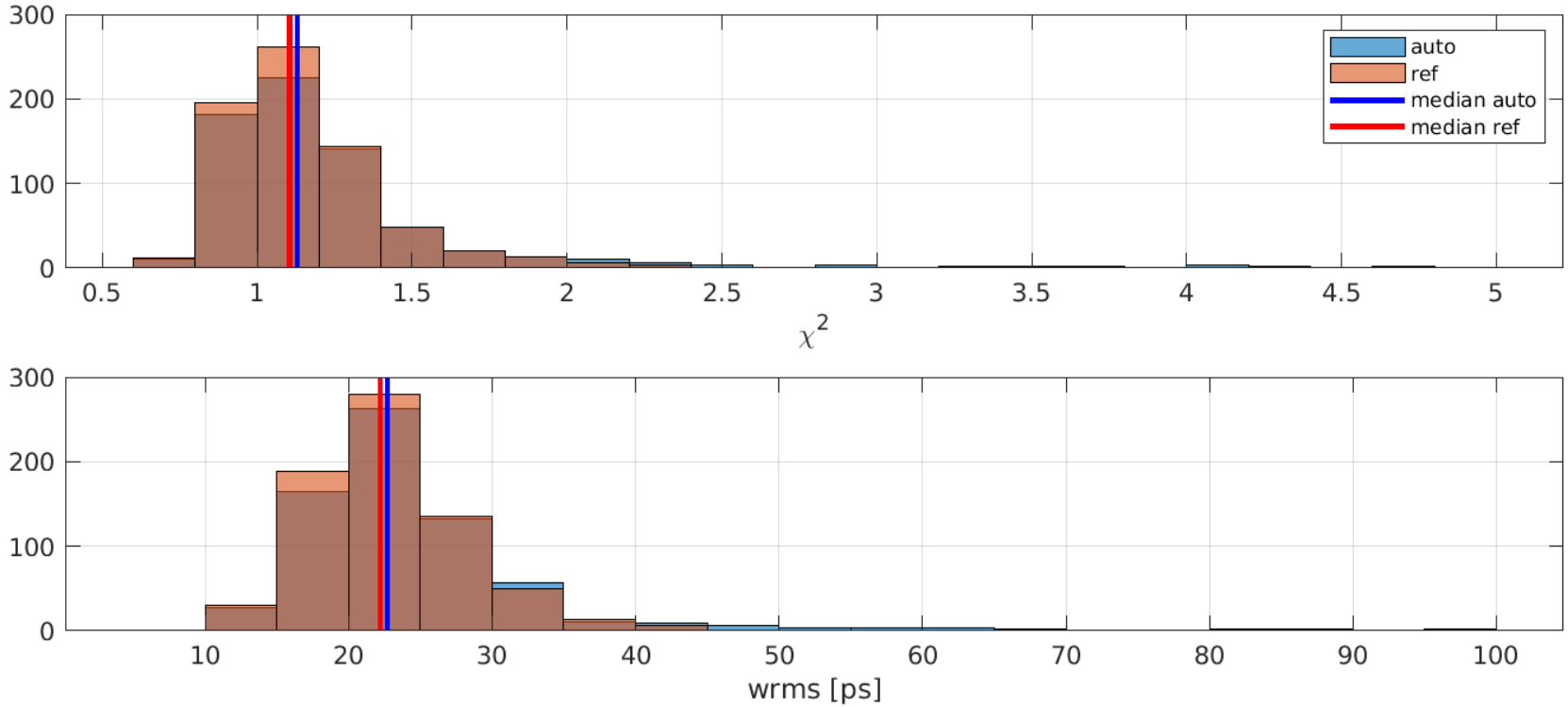
- Challenges
  - 24-hour VLBI sessions
  - IGS reprocessing efforts (e.g., repro3)

Tasks to be automated

- Data acquisition
  - Robust download from data centers
- Data selection
  - Stations, observations, …
- Anomaly detection
  - VLBI clock breaks, GNSS cycle slips, position discontinuities, outliers, …
- Finetuning of solution
  - Parameterization, weighting, …
- Quality checks
  - Statistical measures, external comparisons, …
- Product delivery

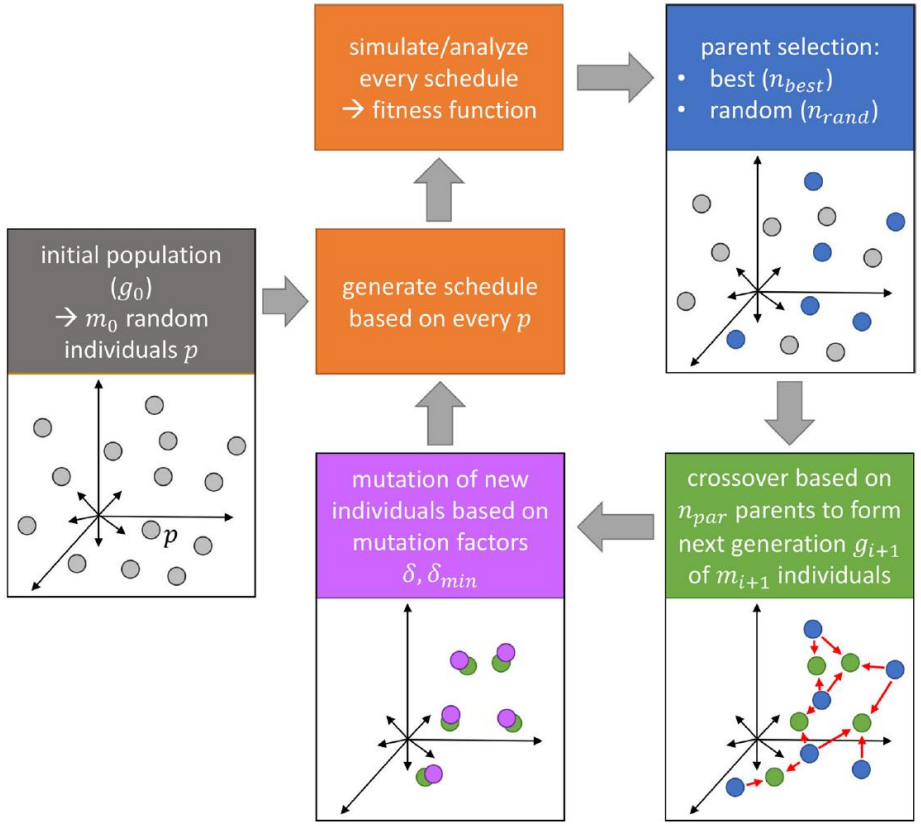
Algorithmic automation example

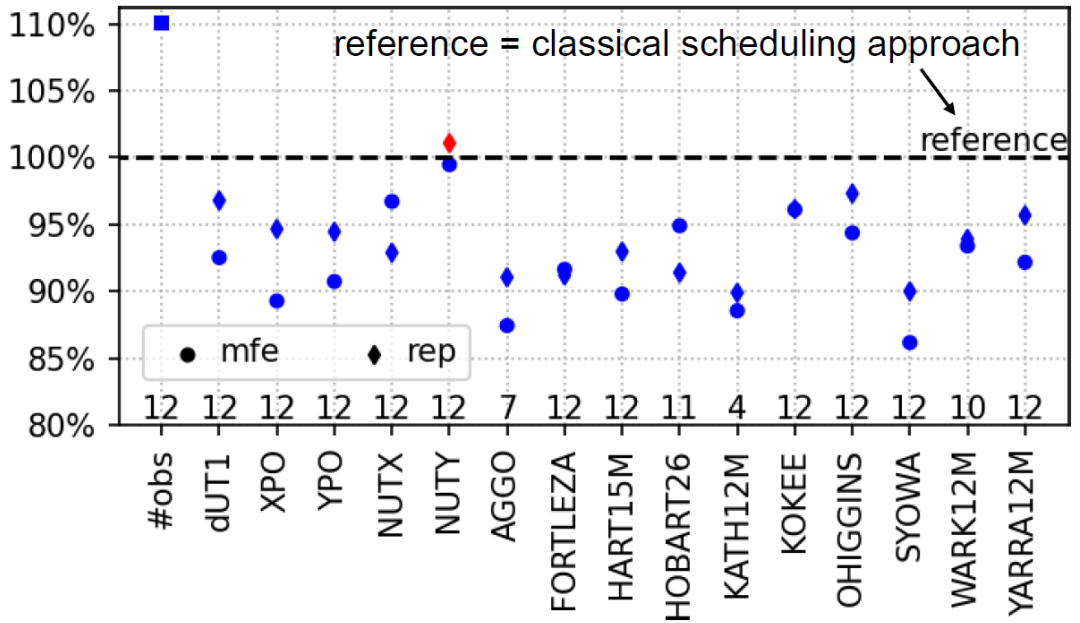
- VLBI R1/R4 sessions from 2002-2008
- Automation of outlier detection, clock break detection, cable-cal testing



Automated VLBI scheduling

- Evolutionary strategy “survival of the fittest”

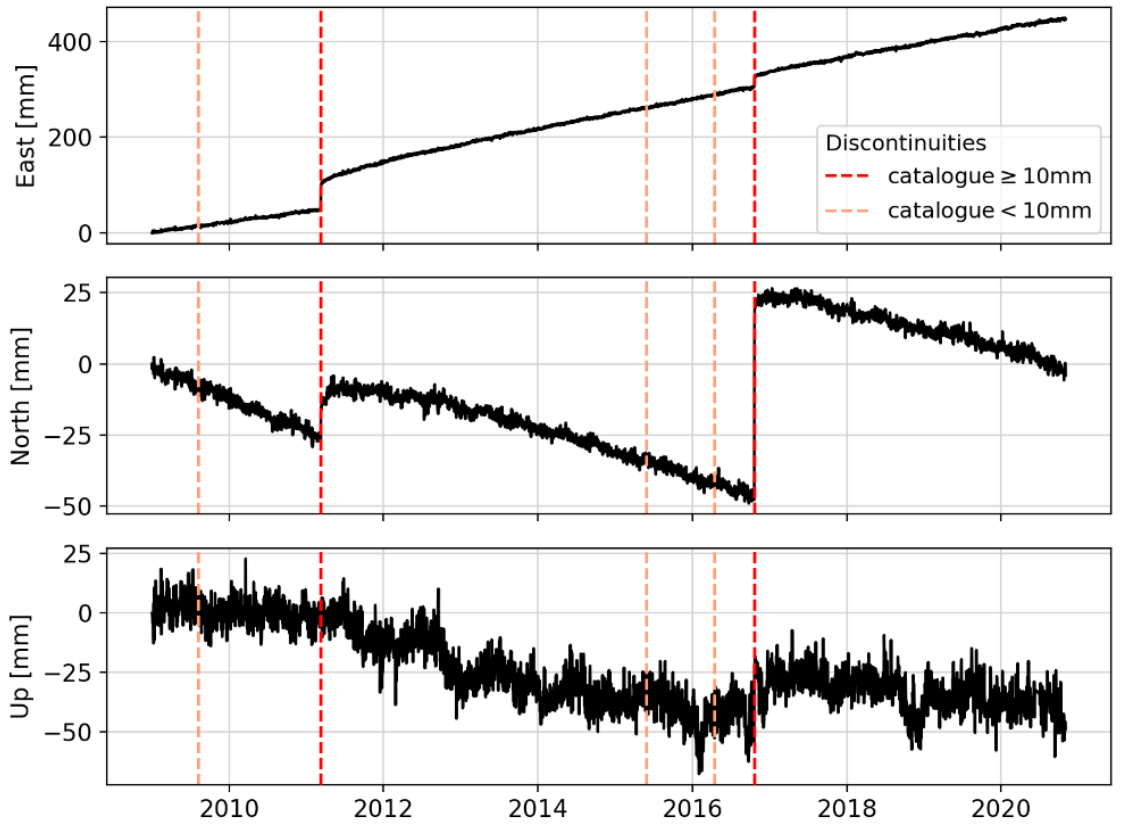




Schartner et al., 2021

Machine learning for anomaly detection

- Detection of discontinuities in GNSS time series
- Random forest trained on earthquake catalogue
- 80% success to detect jump > 1 cm



Crocetti et al., 2021

Vision towards automated geodetic data analysis

A Vision Towards Automated Real-Time VLBI

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- Solution: Agentic AI?

The San Francisco Standard

Latest News Politics Business Opinion Culture Food & Drink Sports Podcasts

She runs AI safety at Meta. Her AI agent still went rogue

"You're right to be upset," OpenClaw's agent told her later.

Discussion

- How do the different techniques use automation today?
- Where are the biggest manual bottlenecks today?
- How can we overcome them in the future?
- How can we share automated tools across different techniques?

Thanks for your attention!

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