



Train motion model calibration

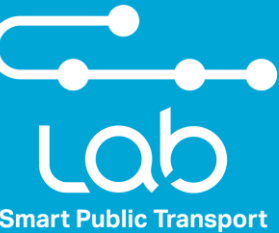
Research agenda and practical recommendations

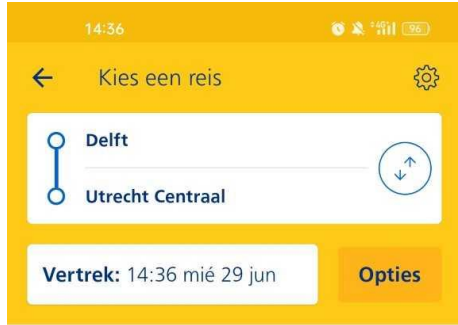
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CALIBRATION

Eerder ^

| | | | |
|-----------------------------|------|----|--|
| 14:30+1 → 15:27 | 0:56 | 1x | |
| IC Intercity + IC Intercity | | | |
| 14:39 → 15:42 | 1:03 | 1x | |
| SPR Sprinter + IC Intercity | | | |
| 14:49 → 15:47 | 0:58 | 1x | |
| SPR Sprinter + IC Intercity | | | |
| 15:00 → 15:57 | 0:57 | 1x | |
| IC Intercity + IC Intercity | | | |



Main goals

- Highlight relevance of train motion model calibration
- State of art
 - Calibration based on operational data
- Proposing
 - Research agenda
 - Practical recommendations

Train motion model parameter variations

$$\frac{dv}{dt} = f_t(v) - f_b(v) - r(v, s) - g(s)$$



$$r(v, s) = r_0 + r_1 v + r_2 v^2$$

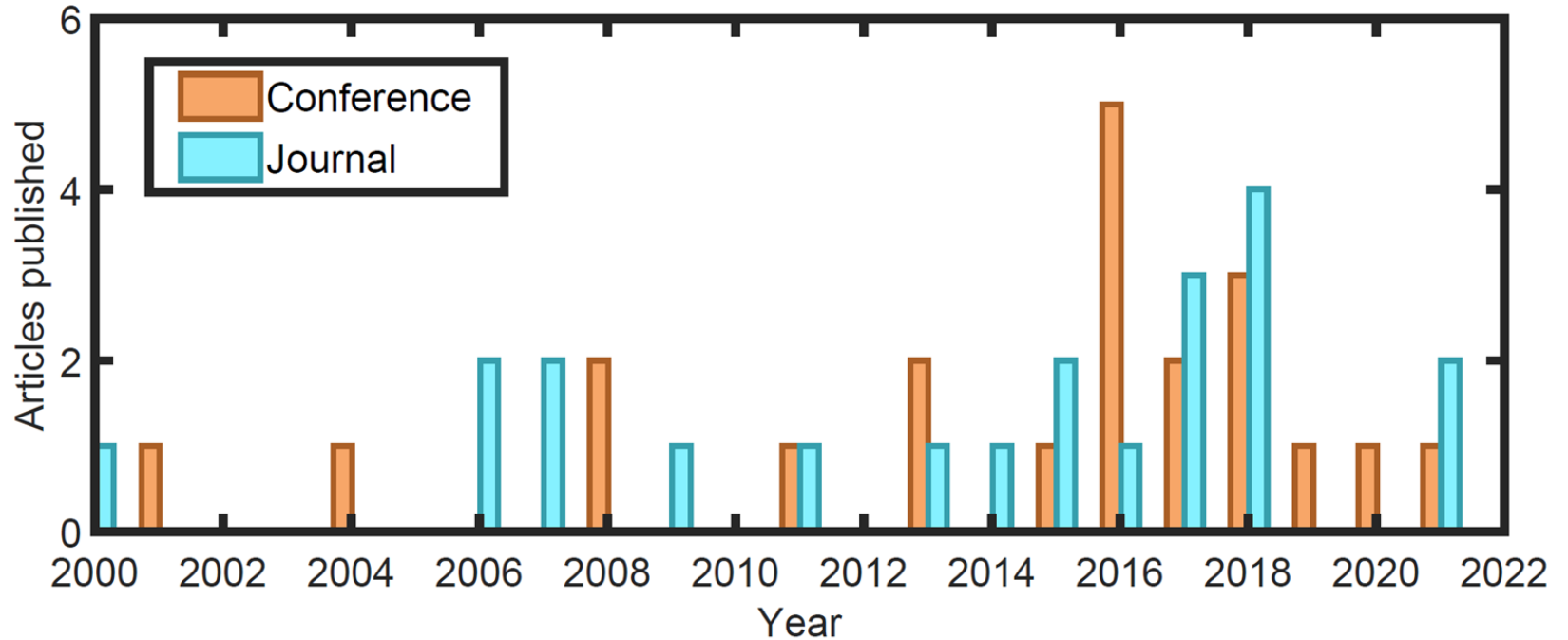
Literature review: methodology

- Search at Scopus and IEEE Xplore
 - Boolean search
 - Snowballing
- Jan 2000 - Dec 2021
- Journal and conference articles

"model" "calibr*" "rail*"
"monitor*" "parameter*"
"estimat*" "determin*"

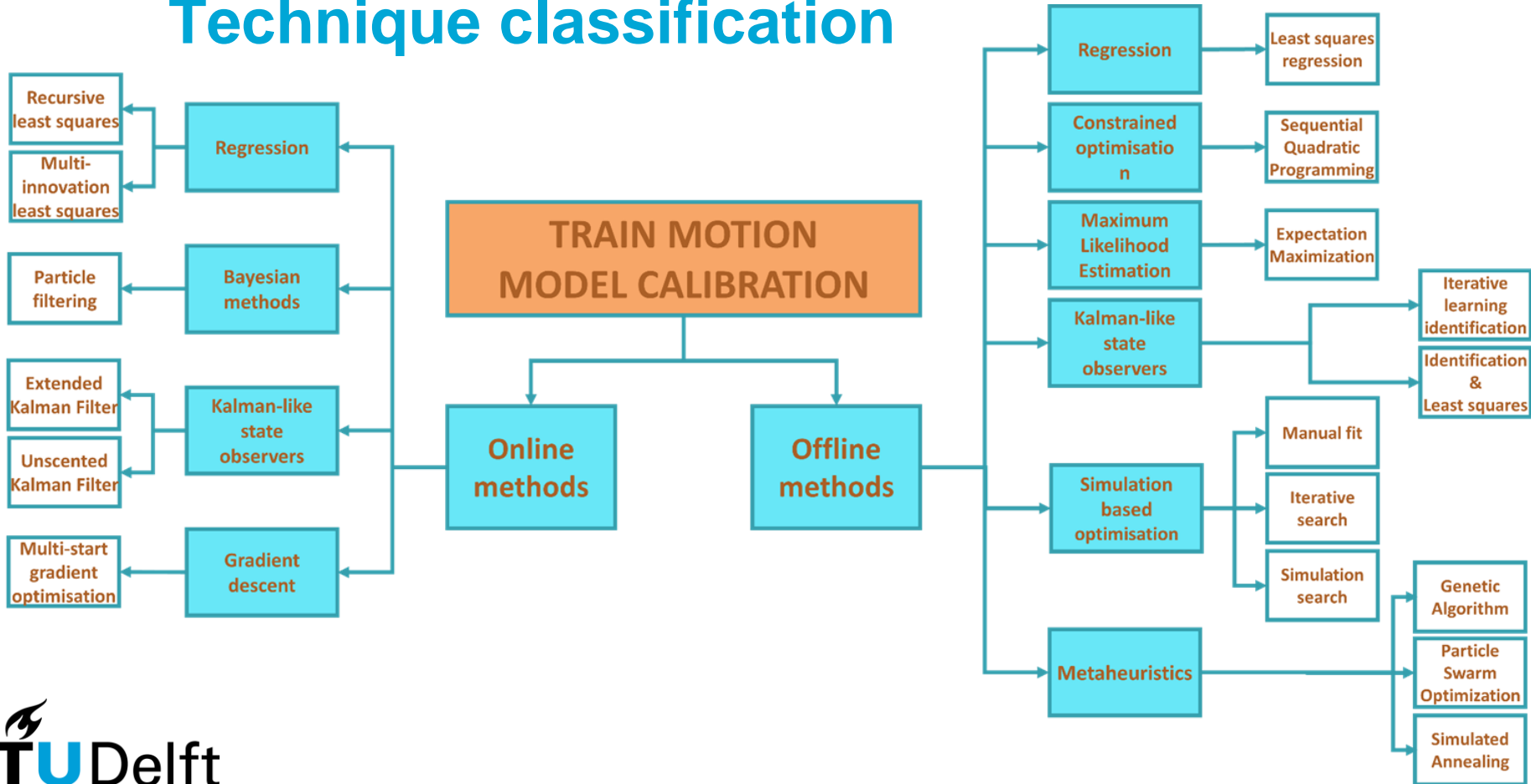
Authors often do **not** state that calibration is performed!!

42 selected articles



21 Conference, 21 Journal

Technique classification



Research agenda

- **Online calibration** for **eco-driving** applications
- **Robust calibration** frameworks
- Quantifying **sources** of parameter **variation**
 - Physical sources
 - Manual driving

Practical recommendations

- Establishing a **public dataset** for
 - Validation
 - Comparison
- Avoid common **pitfalls**
- Infrastructure managers
 - Describe **network geometry** accurately
- If you calibrate, please **mention it!!**

Take home messages

- If you calibrate, please **mention it!!**
- Wide variety of **online & offline** techniques
- **+ research** to boost performance of railway applications
- **Railways need** train motion model **calibration**



Train motion model calibration

Research agenda and practical recommendations

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