LUNDS UNIVERSITET

Machine learning to diagnose acute myocardial infarction based on troponin T blood samples

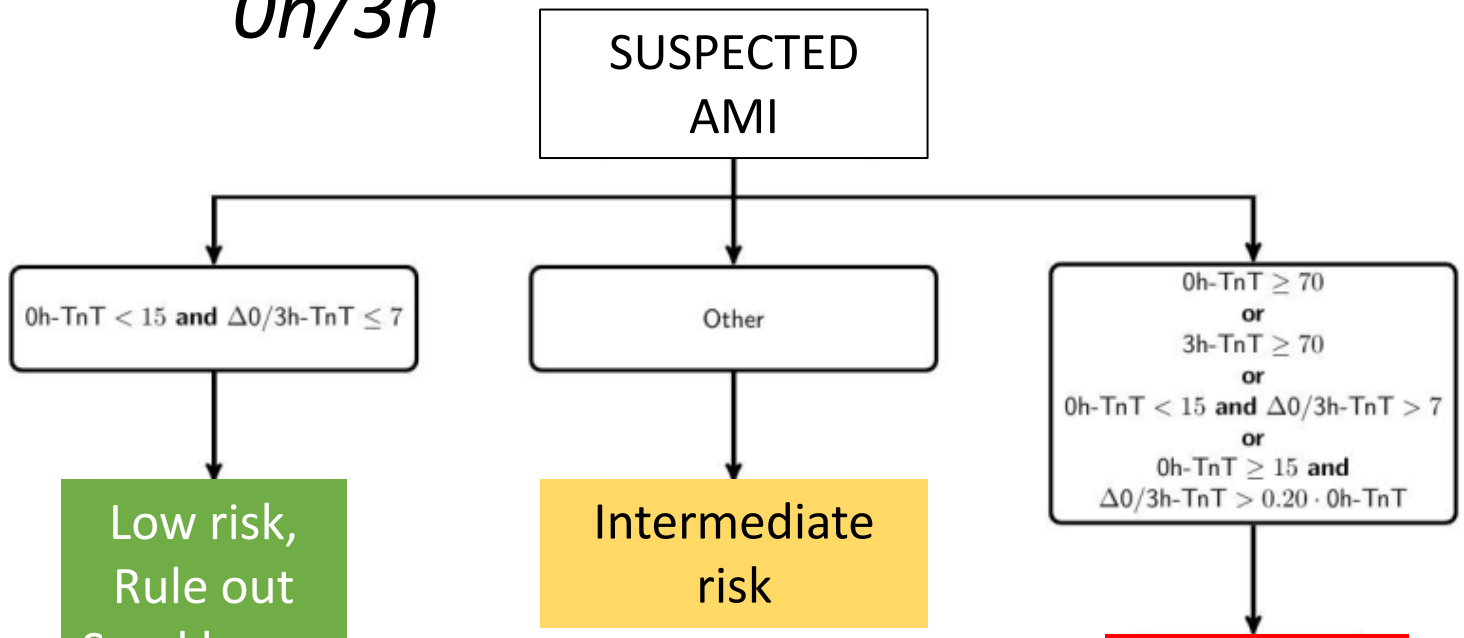
AIR LUND CHEST PAIN

Ulf Ekelund
Professor
Senior Consultant

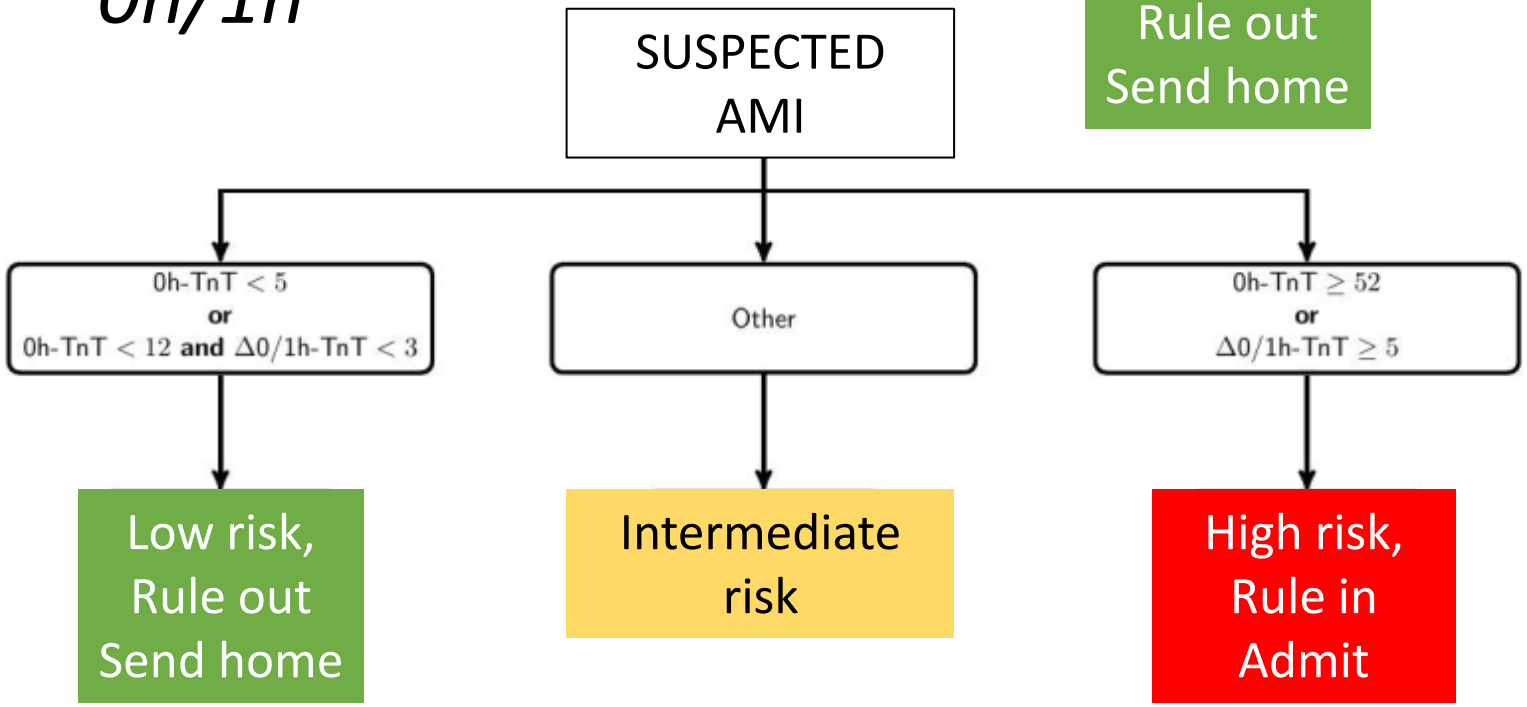
Chest pain

ESC algorithms

0h/3h



0h/1h

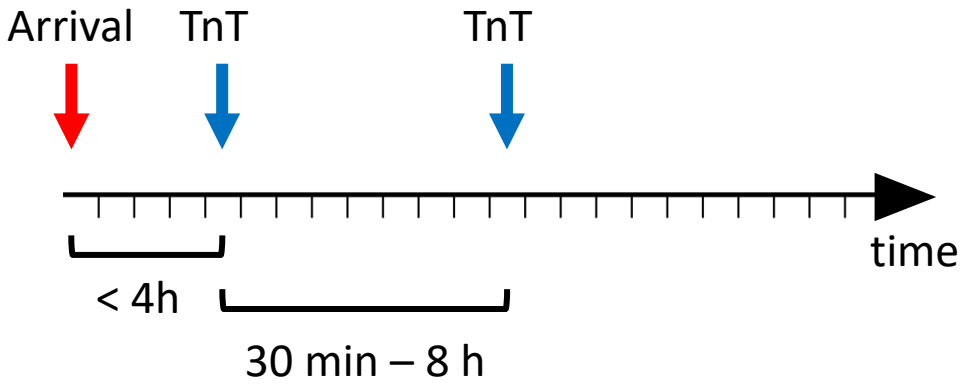


AIM

To assess the ability of ML models to rule in or out AMI compared to the ESC algorithms

Methods

5695 patients with two TnT tests from Lund + Helsingborg EDs during 2010-14



Randomization

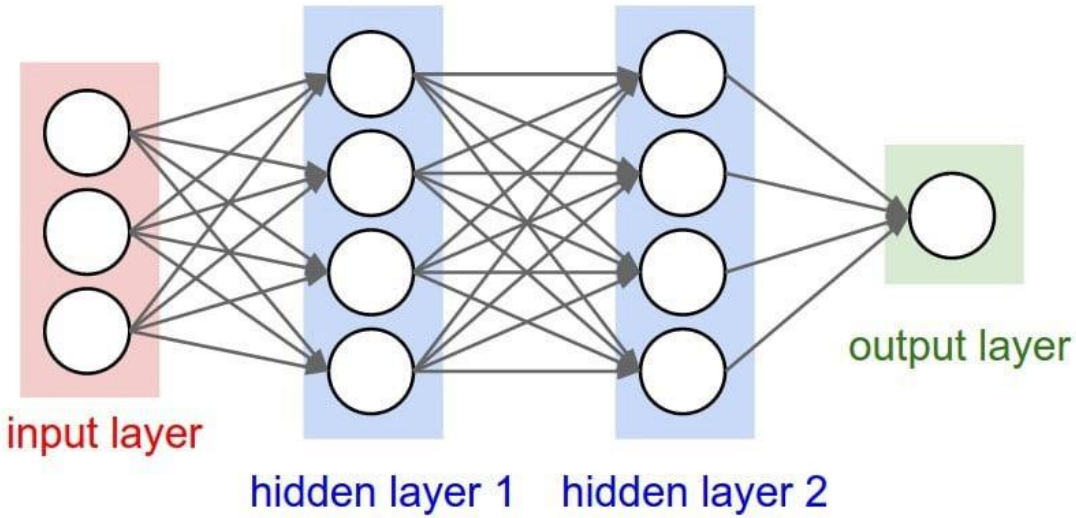
70% ► Training (derivation) set

30% ► Testing (validation) set

ANN and LogReg models

Input

- Age
- Sex
- Two TnT results and
- Rate of change



Output – AMI probability

Comparison with ESC algorithms in patients with the required timing (0/1h or 0/3h) of TnT samples.

Results, test set

73% met timing criteria for one of the ESC algorithms

	Low risk Rule out Send home	Intermediate risk	High risk Rule in Admit	Sum
ESC algorithms	55.2% (98.8% NPV)	24.5%	20.3% (59.9% PPV)	100%
ANN	59.2% (98.9% NPV)	20.2%	20.6% (60.4% PPV	100%
LogReg	57.1 (98.9% NPV)	22.5%	20.4% (60.0% PPV)	100%

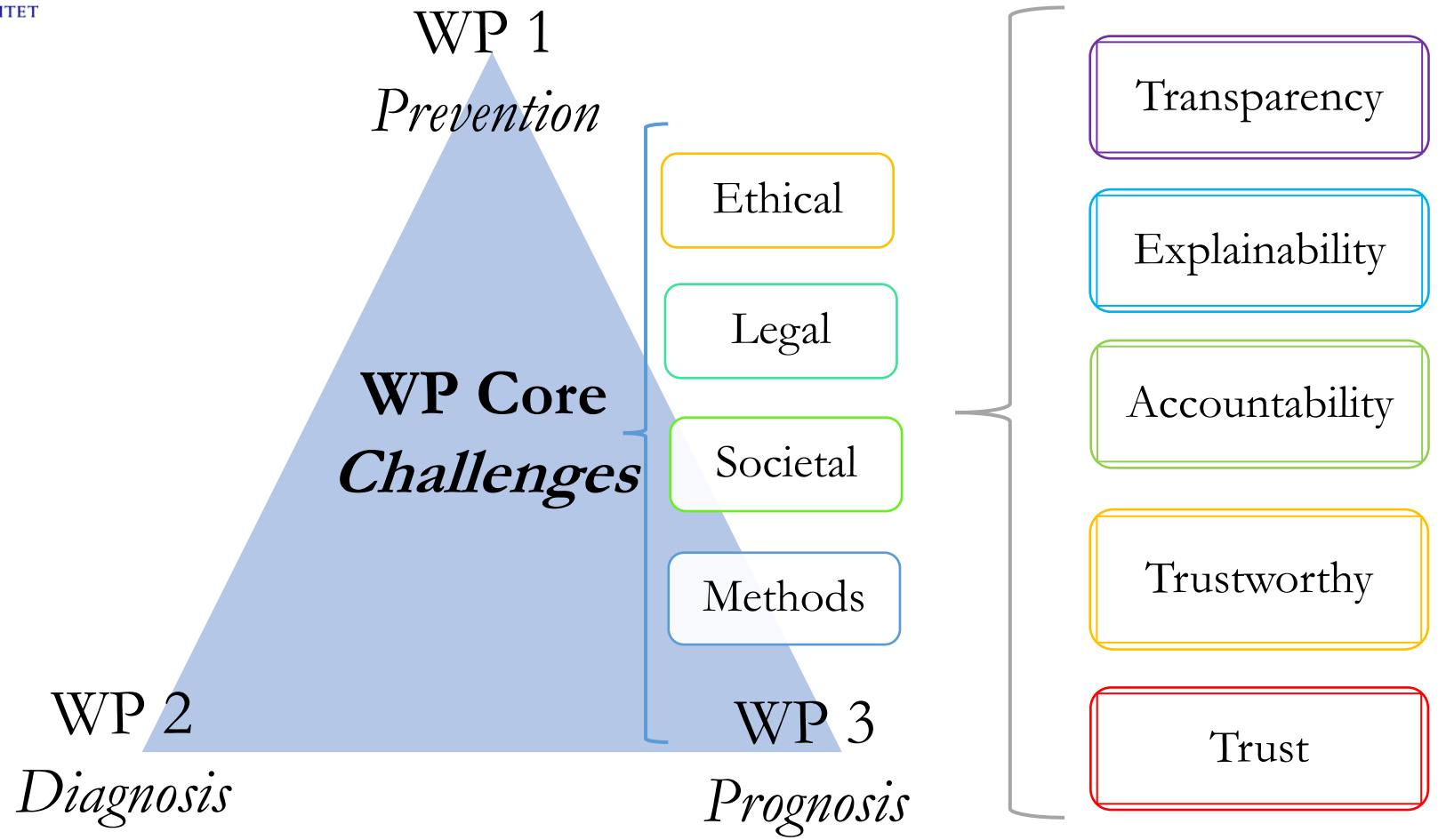
Conclusion

ANN and LogReg can improve risk assessment in ED chest pain patients

- Safe rule out ↑, intermediate risk group↓
- Numeric estimate of AMI risk
- No timing between TnT tests required

What now?

Additional input features, eg from ECG, vital signs, previous medical history, socioeconomic factors aso.



Project: Literature Review

- Stefan Larsson, associate professor, Technology and Society (Lund)
- Charlotte Högberg, Doctoral student, Technology and Society (Lund)
- Laetitia Tanqueray, Project Assistant at Technology and Society (Lund)

Transparency

- “Black box”, poor explainability (xAI)
- Proprietorship
- Market complexity
- Distributed, personalised outcomes
- Algorithmic literacy, layman competence
- Lingual translation, terminologies
- Avoiding abuse

- Larsson, S., & Heintz, F. (2020). Transparency in artificial intelligence. *Internet Policy Review*, *9*(2).
- Larsson, S. (2019). The socio-legal relevance of artificial intelligence. *Droit et société*, (3), 573-593.

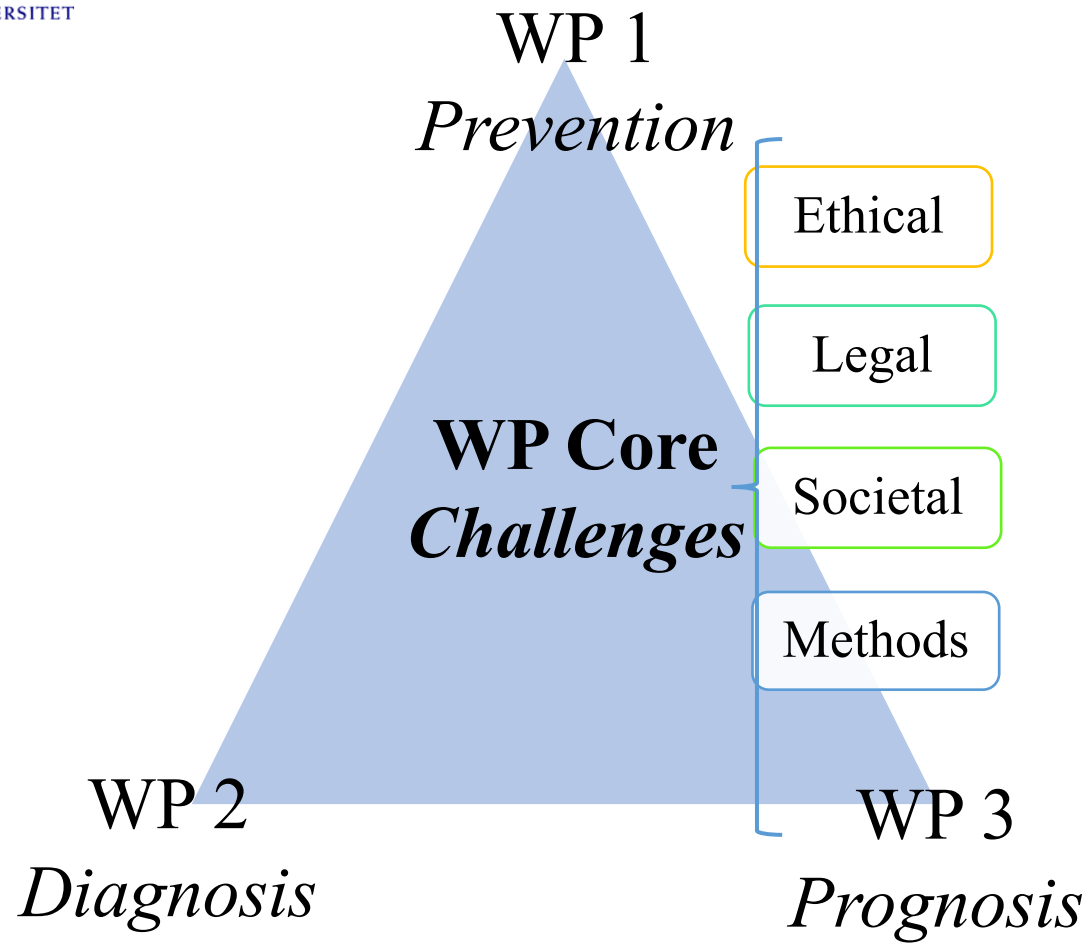
Systematic Literature Review

(AI **OR** "artificial intelligence" **OR** "machine learning" **OR** "deep learning" **OR** "reinforcement learning" **OR** "natural language processing" **OR** "augmented intelligence" **OR** "neural networks" **OR** GAN **OR** robotic*)

AND (medic* **OR** health* **NOT** healthy)

AND (fairness **OR** equality **OR** accountab* **OR** trust* **OR** governance **OR** xAI **OR** explainab* **OR** transparent* **OR** "black box" **OR** "human-centric" **OR** "human-in-the-loop" **OR** privacy)

Web of Science, equaling to 3,000 hits



Transparency

Explainability

Accountability

Trustworthy

Trust

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