

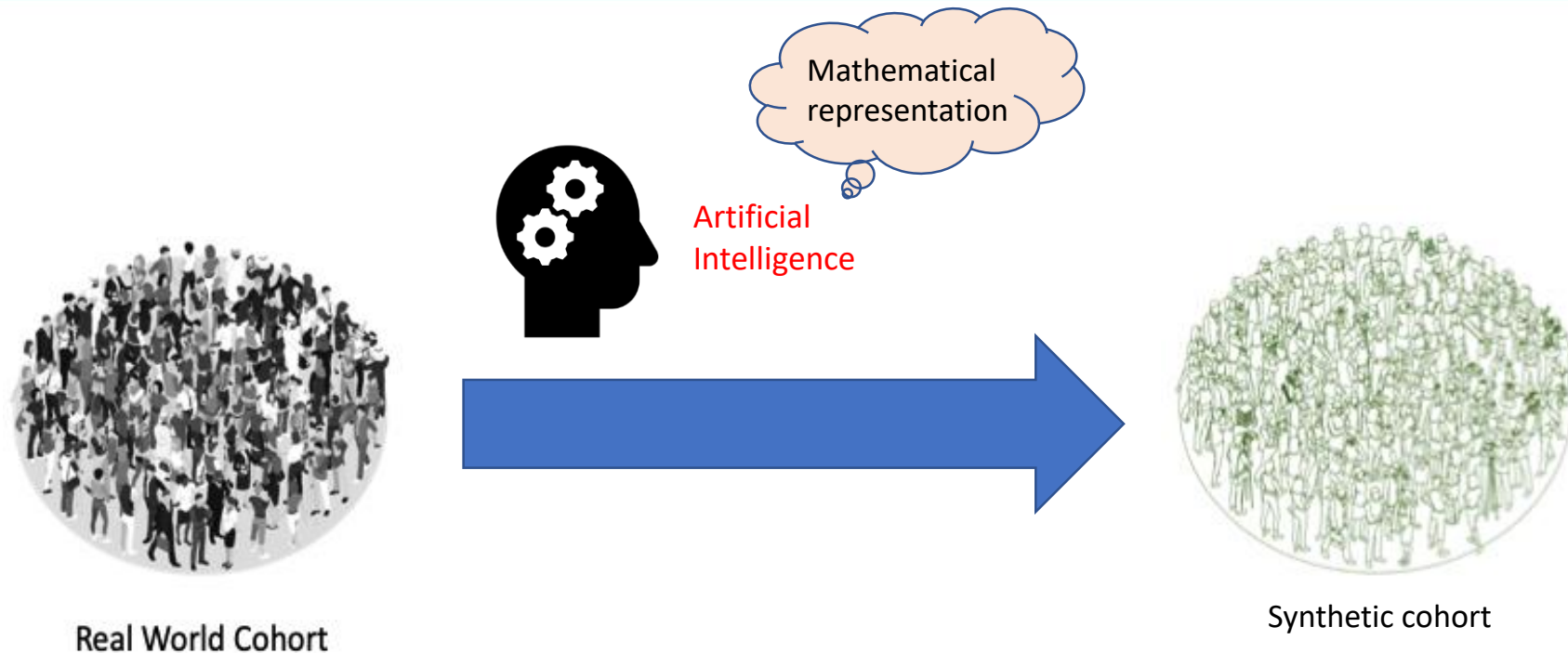
Simulation of Synthetic Patient Cohorts

Prof. Dr. Holger Fröhlich

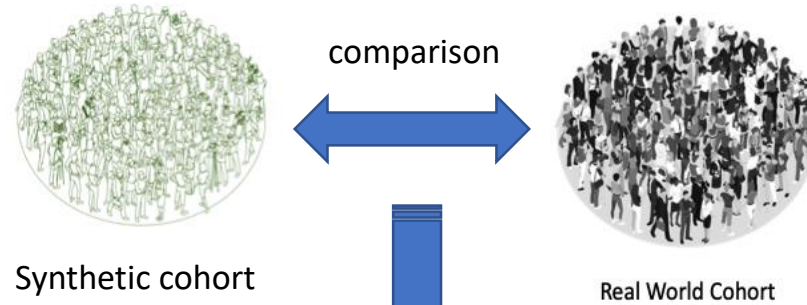
Fraunhofer SCAI

holger.froehlich@scai.fraunhofer.de

How to generate a «synthetic» or «virtual» cohort?



Can we trust synthetic cohorts?

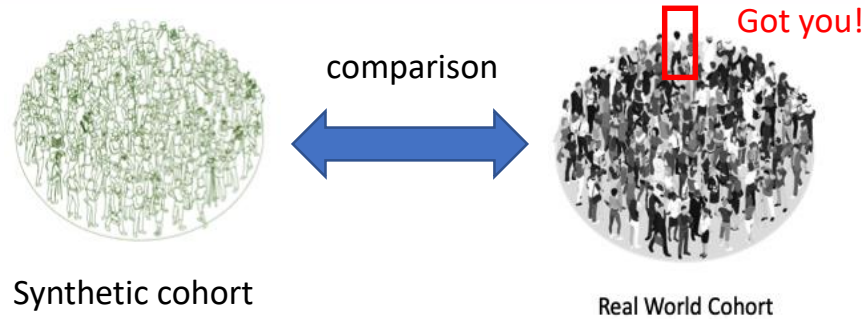


Quality Report / Statistical Measures



Reject unrealistic synthetic subjects

Addressing Data Privacy Concerns



Solution

- Train AI algorithm under specific restrictions (differential privacy)
- Provide guarantees on risk of re-identifying any real patient

Where can synthetic patient data help?

Science

- Help researchers understand data that they cannot directly access
- „Enlarging“ underrepresented patient groups
- Training of AI models with synthetic data

Clinical trials (pharma industry)

Simulation of „What, if?“ scenarios → inclusion / exclusion criteria

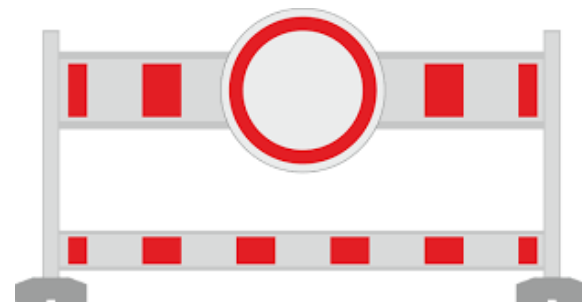
Simulated control arm

Clinical routine

"patients-like me" scenarios

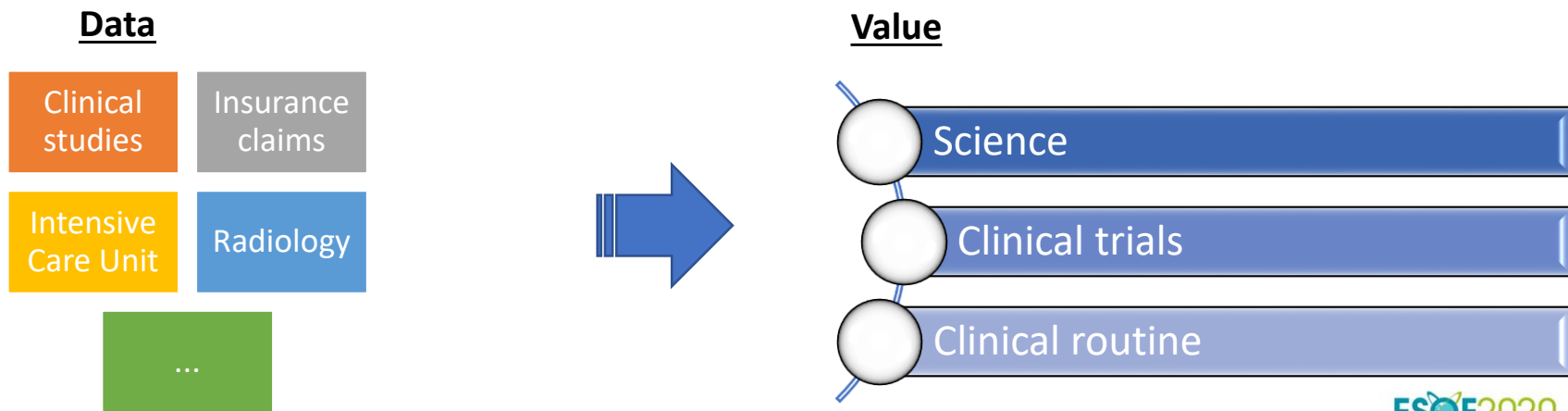
Understanding the Limits of Synthetic Cohorts

- We use AI to generate synthetic cohorts
- AI needs sufficiently large training data
- Synthetic cohorts cannot generate features that are not present in the training data
 - Examples:
 - Generating people with blue eye color, if training data contains only people with brown eye color
 - Simulating the clinical response to a drug treatment, which has never been tested in any trial



Summary: Simulation of Synthetic Patient Cohorts

- Modern AI methods (e.g. VAMBN, Multi-NODEs) allow for simulating realistic synthetic cohorts
 - Longitudinal
 - Respecting data privacy
 - Quality control



What's next?

How to translate the approach into industrial applications?

- Main point: We need to build trust
- We need demonstrator projects, e.g.
 - NFDI4Health in Germany (speaker: Prof. Juliane Fluck)
- Public-private partnerships (e.g. AETIONOMY), including data privacy officers and lawyers from different organization in Europe and beyond

Thank you to ...

Prof. Martin Hofmann-Apitius

Dr. Luise Gootjes-Dreesbach

Meemansa Sood

Philipp Wendland

Colin Birkenbihl

ESOF2020
EUROSCIENCE OPEN FORUM
TRIESTE

