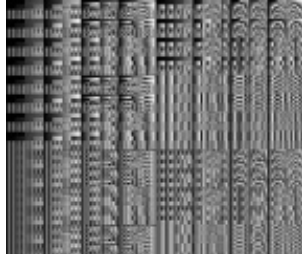


# Open Science with Closed Data

Allan Hanbury

# “Classic” Data Science



Data



Analysis

Data Repository

Code Repository

Publication

# Closed Data



Huge

Real-time

Non-distributable

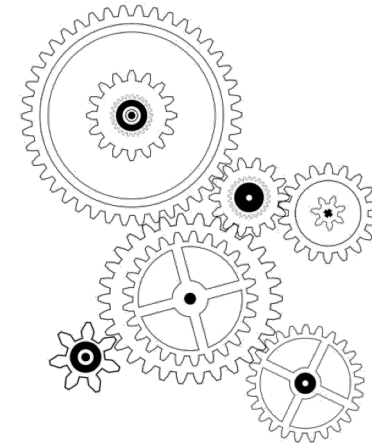




Data Repository

<https://creazilla.com/nodes/54725-page-facing-up-emoji-clipart>

Code Repository



Publication

<https://www.flickr.com/photos/kylemcdonald/6187343093/>

<https://www.needpix.com/photo/1331454/>

# Example:

## COVID-19 Analysis Pipeline



Provide anonymised data

Epidemic  
Reporting  
System



**dwh**  
simulation services  
technical solutions



**COMPLEXITY  
SCIENCE  
HUB  
VIENNA**

Provide anonymised data

Perform data analysis

Parametrize models

Epidemic  
Reporting  
System

Mobile Telephony  
Operator 1



Detailed  
statistics



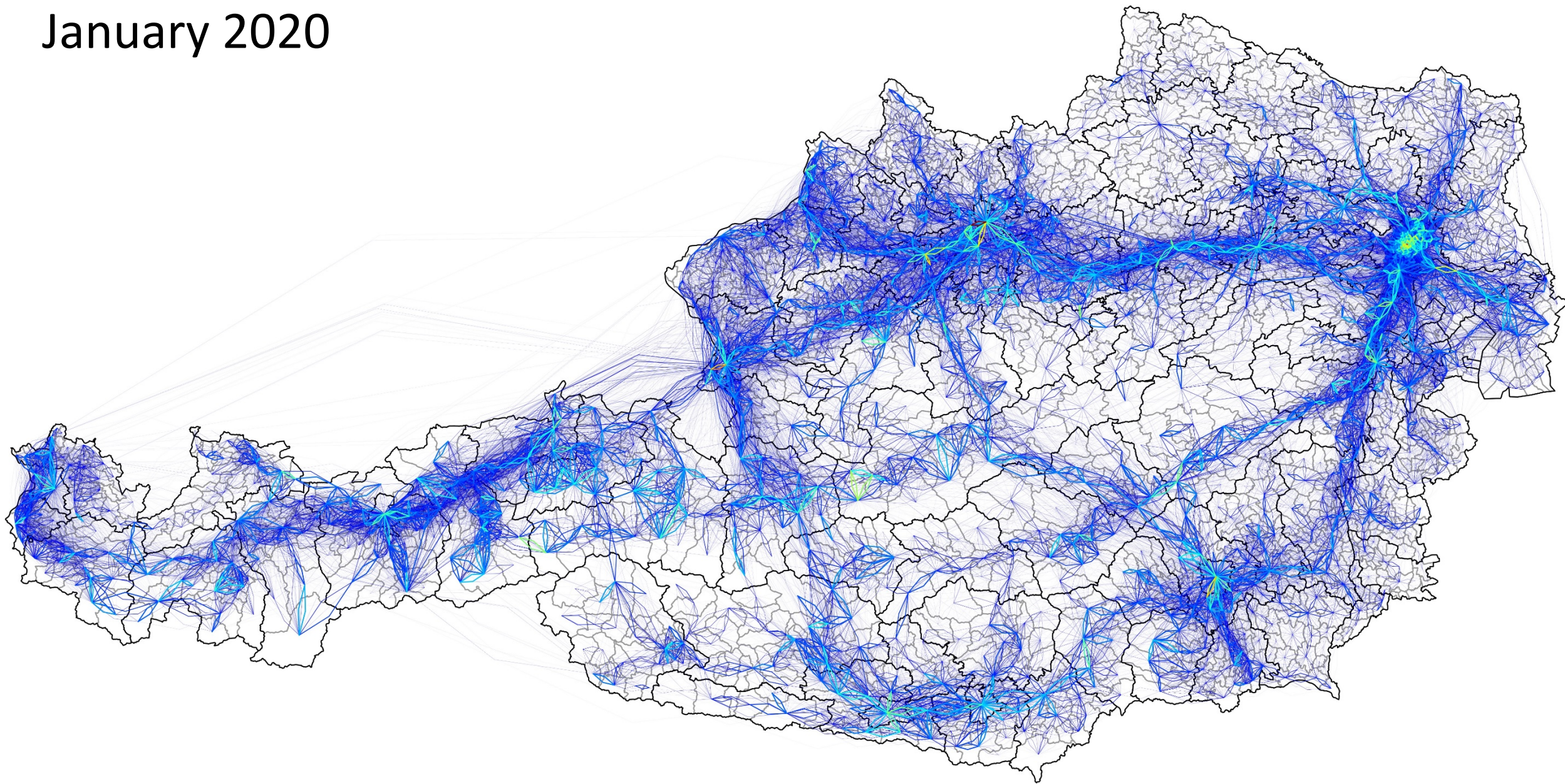
**dwh**  
simulation services  
technical solutions



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SCIENCE  
HUB  
VIENNA**

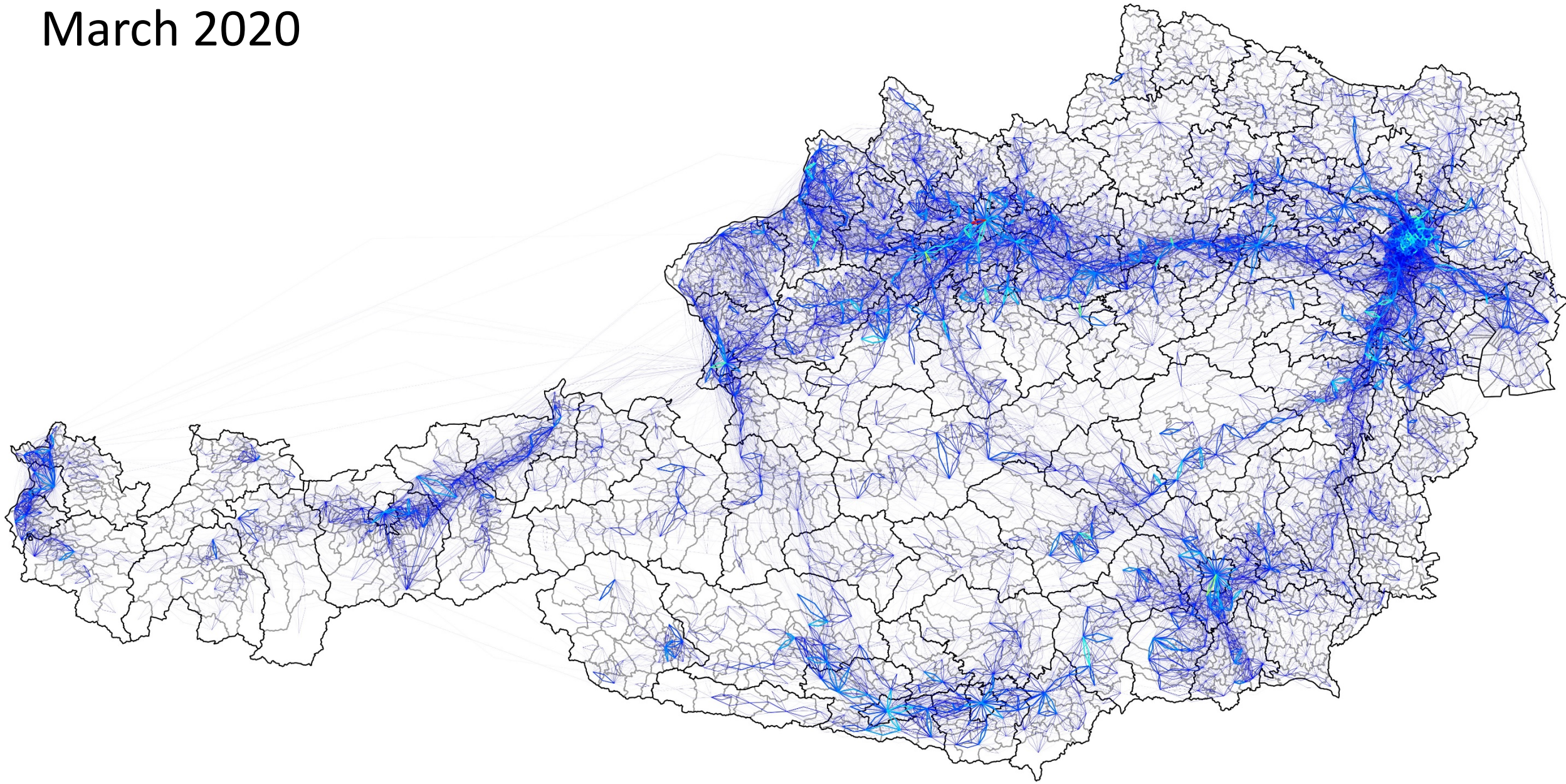


January 2020

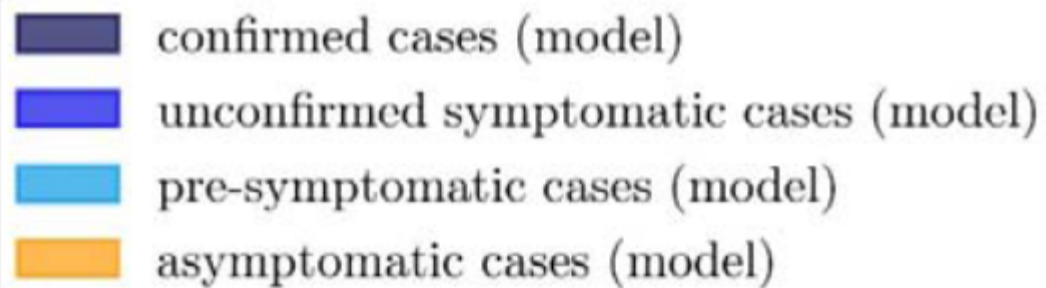
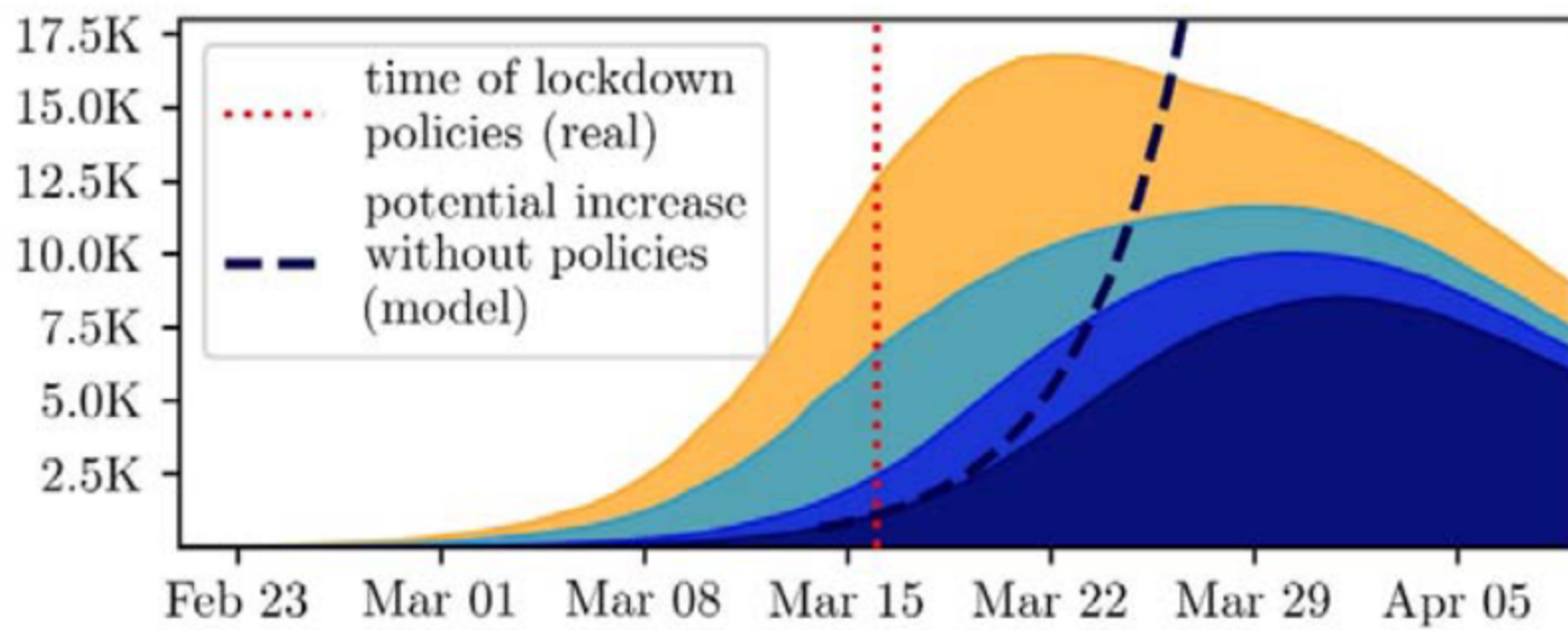




March 2020









Provide anonymised data

Perform data analysis

Parametrize models

Epidemic  
Reporting  
System

Mobile Telephony  
Operator 1



Detailed  
statistics



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technical solutions



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SCIENCE  
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VIENNA**

Provide anonymised data

Perform data analysis

Parametrize models

Make evidence-based  
recommendations

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HUB  
VIENNA

Insights



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Operator 2



Detailed  
statistics



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Insights



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Operator 2



dwh  
simulation services  
technical solutions



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Detailed  
statistics

Insights



Research Outputs

# The impact of COVID-19 on relative changes in aggregated mobility using mobile-phone data

Georg Heiler<sup>a,b</sup>, Allan Hanbury<sup>a,b</sup> and Peter Filzmoser<sup>c</sup>

<sup>a</sup>Institute of Information Systems Engineering, TU Wien, Favoritenstr. 9-11, 1040 Vienna, Austria; <sup>b</sup>Complexity Science Hub, Josefstädter Str. 39, 1080 Vienna, Austria; <sup>c</sup>Computational Statistics Institute of Statistics and Mathematical Methods in Economics, TU Wien, Wiedner Hauptstrasse 8-10 1040 Vienna

## ARTICLE HISTORY

Compiled September 9, 2020

## ABSTRACT

Evaluating relative changes leads to additional insights that would remain hidden when only evaluating absolute changes. We analyze a dataset describing the mobility of mobile phones in Austria before, during COVID-19 lock-down measures until recently.

By applying compositional data analysis we show that formerly hidden information becomes available: we see that the elderly population groups increase relative mobility and that the younger groups, especially on weekends, also do not decrease their mobility as much as the others.

## KEYWORDS

compositional-data-analysis, mobility, pandemic, big-data, geospatial-data

Provide a

Epidemic  
Reporting  
System

# Supporting Austria through the COVID-19 Epidemics with a Forecast-Based Early Warning System

Martin Bicher<sup>1,2,†</sup>, Martin Zuba<sup>3,†</sup>, Lukas Rainer<sup>3</sup>, Florian Bachner<sup>3</sup>, Claire Rippinger<sup>2</sup>,  
Herwig Ostermann<sup>3,4</sup>, Nikolas Popper<sup>1,2,5</sup>, Stefan Thurner<sup>6,7,8,9</sup>, Peter Klimek<sup>6,7\*</sup>

<sup>1</sup>*Institute of Information Systems Engineering, TU Wien,  
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<sup>2</sup>*dwh simulation services, dwh GmbH,  
Neustiftgasse 57-59, A-1070 Vienna, Austria*

<sup>3</sup>*Austrian National Public Health Institute,  
Stubenring 6, A-1010 Vienna, Austria*

<sup>4</sup>*Private University for Health Sciences,  
Medical Informatics and Technology GmbH,  
UMIT, Eduard-Wallnöfer-Zentrum 1,  
A-6060 Hall in Tirol, Austria*

<sup>5</sup>*Society for Decision Support Policy and Planning,  
DEXHELPP, Neustiftgasse 57-59,  
A-1070 Vienna, Austria*

<sup>6</sup>*Section for Science of Complex Systems,  
Medical University of Vienna,  
Spitalgasse 23, A-1090 Vienna, Austria*

<sup>7</sup>*Complexity Science Hub Vienna,  
Josefstädterstraße 39, A-1080 Vienna, Austria*

<sup>8</sup>*International Institute for Applied Systems Analysis,  
Schlossplatz 1, A-2361 Laxenburg, Austria*

<sup>9</sup>*Santa Fe Institute, 1399 Hyde Park road,  
Santa Fe, NM 87501, USA*

<sup>†</sup>*equal contributions*

(Dated: July 2020)

**Background:** The corona crisis hit Austria at the end of February 2020 with one of the first European superspreading events. In response, the governmental crisis unit commissioned a forecast consortium with regularly projections of case numbers and demand for hospital beds.

**Methods:** We consolidated the output of three independent epidemiological models (ranging from agent-based micro simulation to parsimonious compartmental models) and published weekly short-term forecasts for the number of confirmed cases as well as estimates and upper bounds for

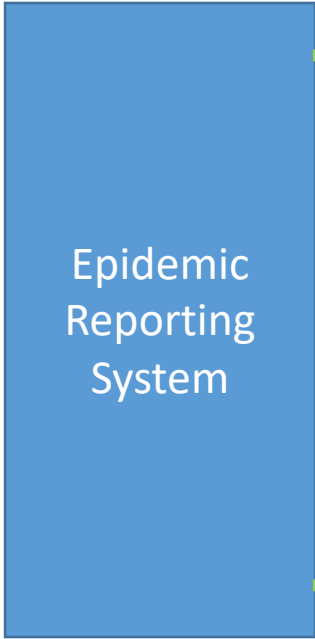
the evidence-based  
recommendations

Provide anonymised data

Perform data analysis

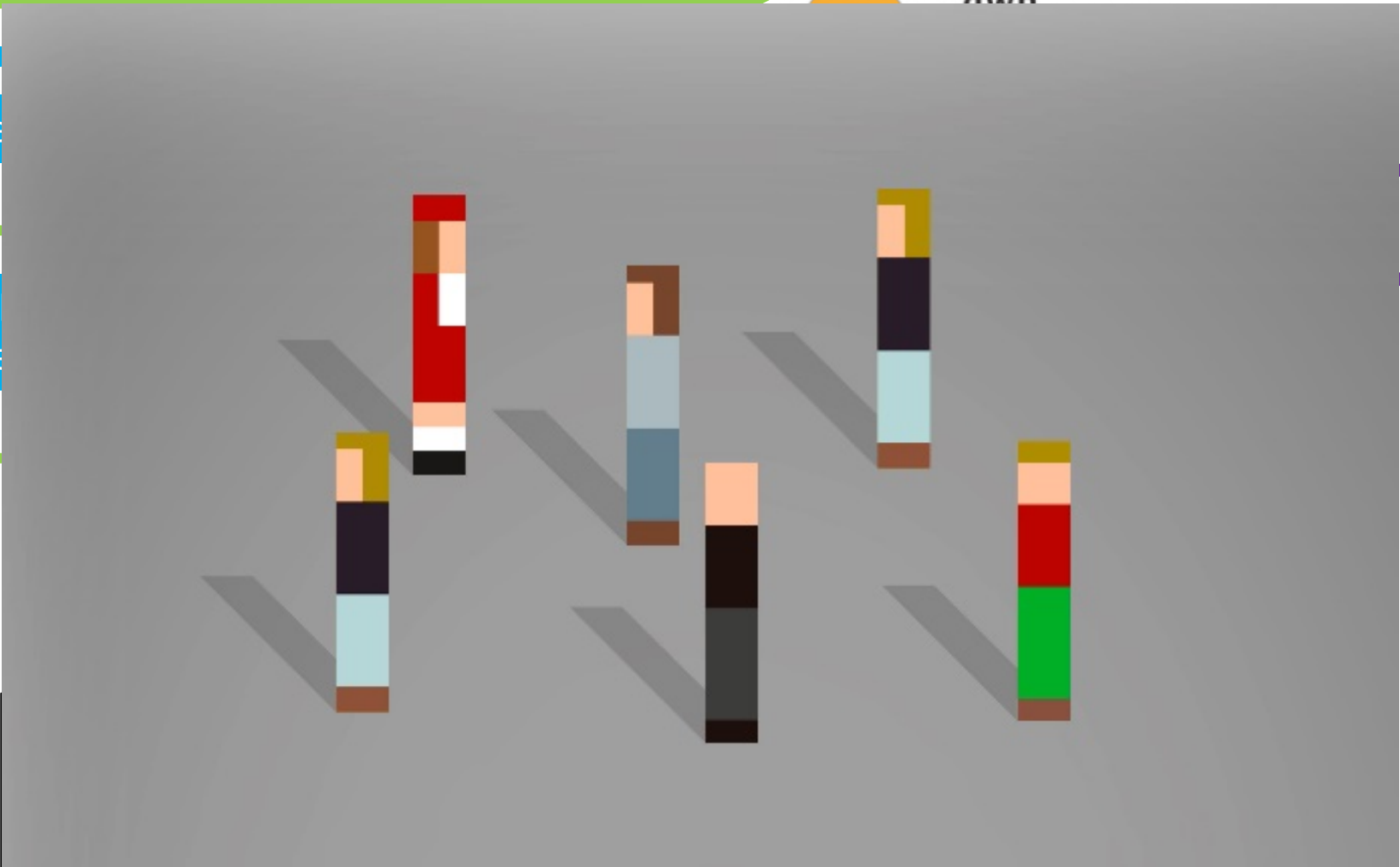
Parametrize models

Make evidence-based recommendations



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Op

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ARTICLE HISTORY  
Compiled September 9, 2020

**ABSTRACT**  
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By applying compositional data analysis we show that formerly hidden information becomes available: we see that the elderly population groups increase relative mobility and that the younger groups, especially on weekends, also do not decrease their mobility as much as the others.

KEYWORDS

<sup>1</sup>A-6060 Hall in Tirol, Austria  
<sup>2</sup>Society for Decision Support Policy and Planning,  
DEXHELPP, Neustiftgasse 57-59,  
A-1070 Vienna, Austria  
<sup>3</sup>Section for Science of Complex Systems,  
Medical University of Vienna,  
Spitalgasse 23, A-1090 Vienna, Austria  
<sup>4</sup>Complexity Science Hub Vienna,  
Josefstädterstraße 39, A-1080 Vienna, Austria  
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Santa Fe, NM 87501, USA  
<sup>7</sup>equal contributions  
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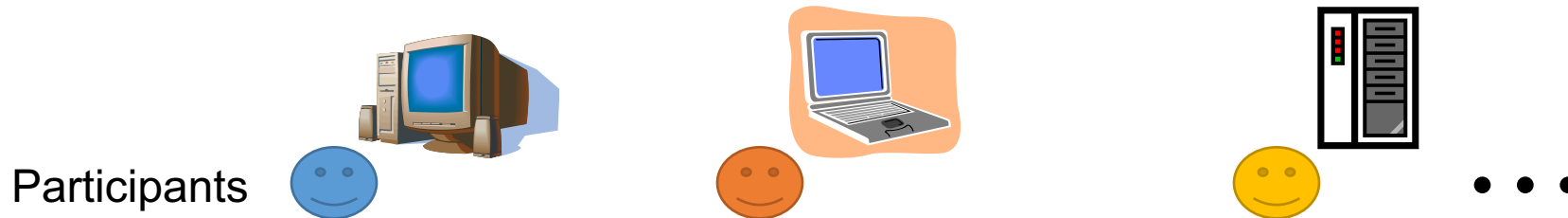
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**Methods:** We consolidated the output of three independent epidemiological models (ranging



Evaluation-as-a-Service



# Evaluation Campaigns / Shared Tasks / Challenges / Competitions / ...



# Academic Evaluation Campaigns

## Text REtrieval Conference (TREC)

*...to encourage research in information retrieval  
from large text collections.*



NTCIR



The CLEF Initiative

Conference and Labs of the Evaluation Forum



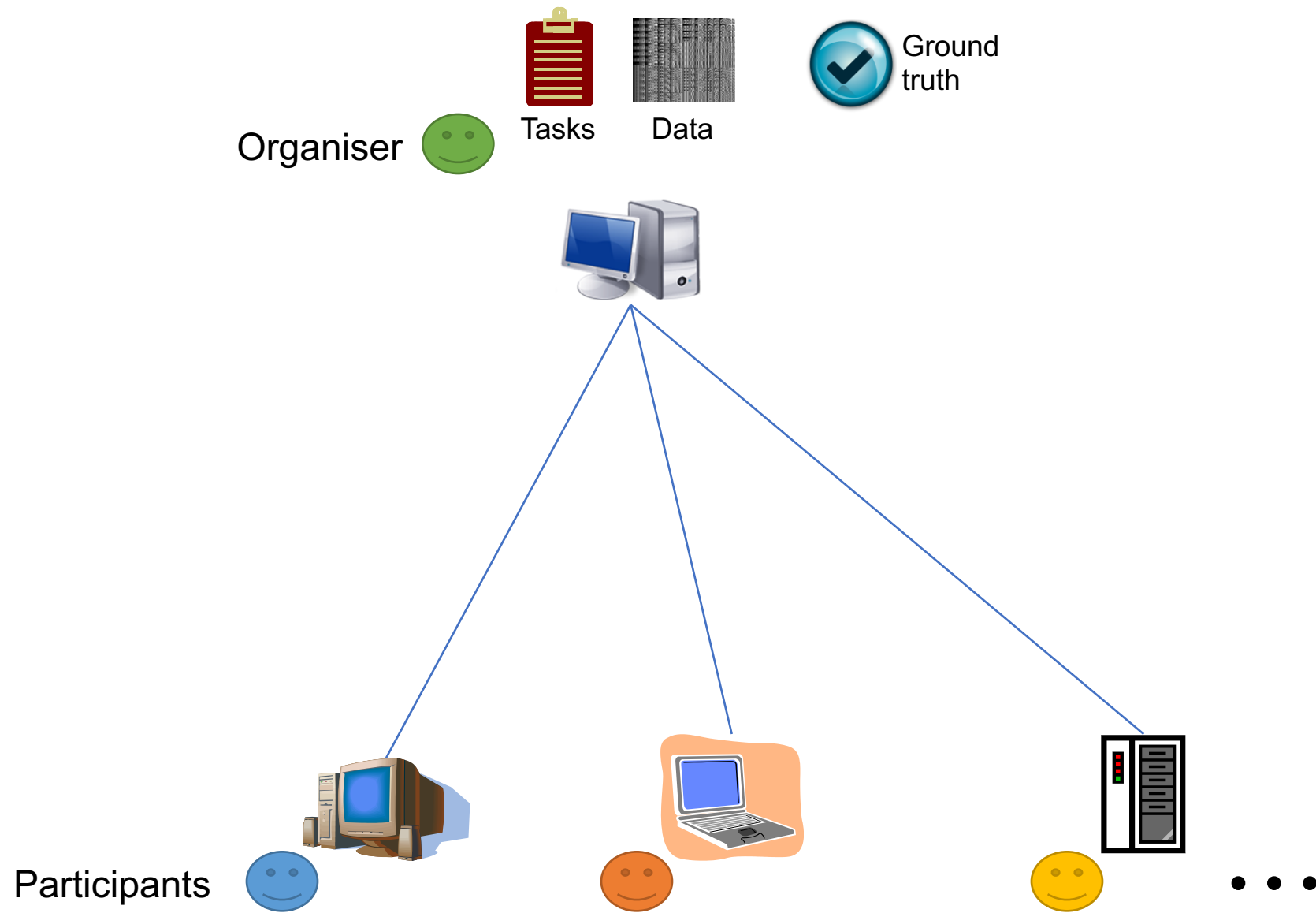
MediaEval Benchmark

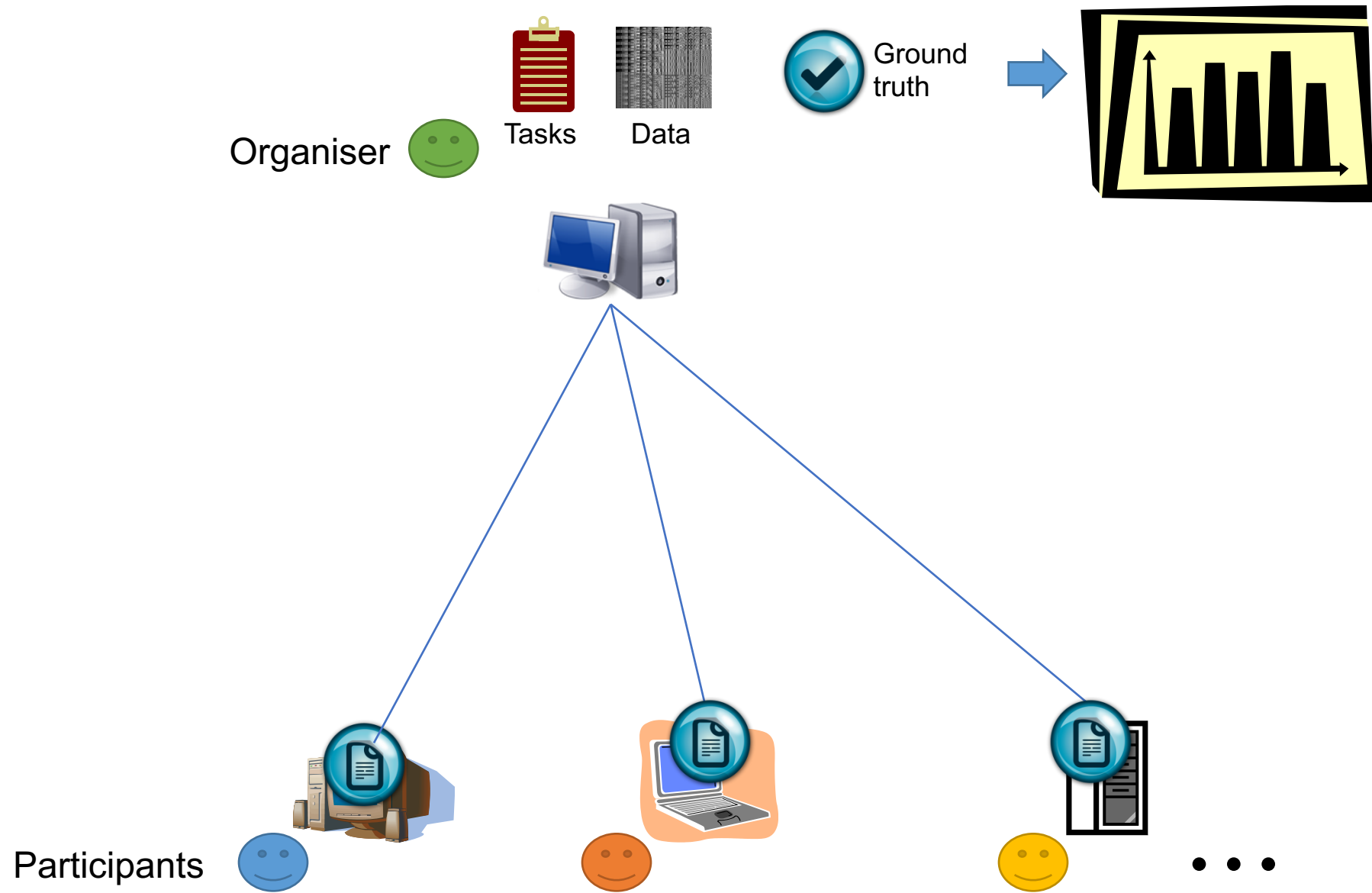


PASCAL2

Pattern Analysis, Statistical Modelling and  
Computational Learning









Tasks



Data



Ground  
truth



Data Repository

Code Repository

Publication



Tasks



Data



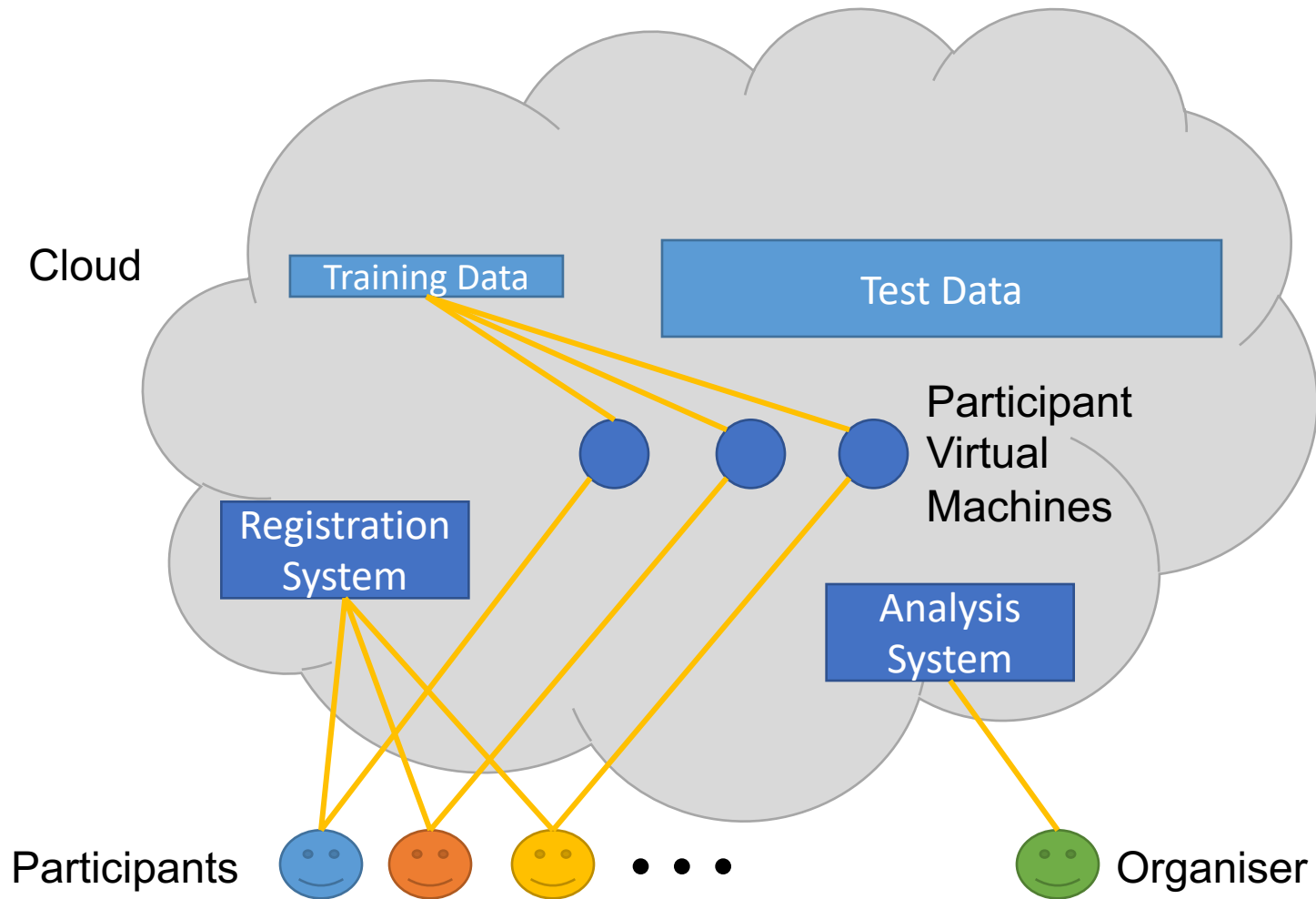
Ground  
truth

# VISCERAL Anatomy Benchmarks

Whole body labelling in 3D  
medical imaging data

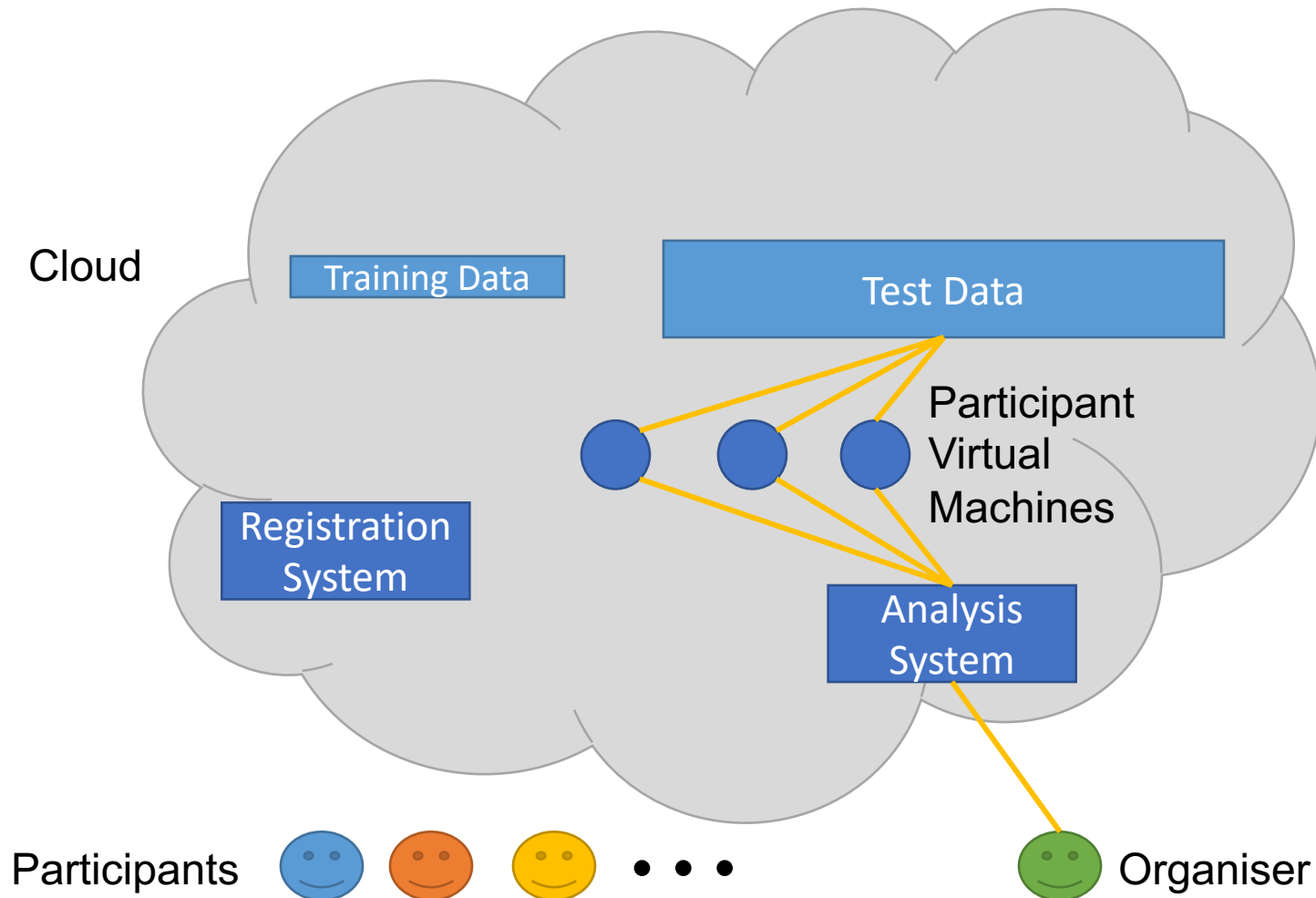


# Training Phase

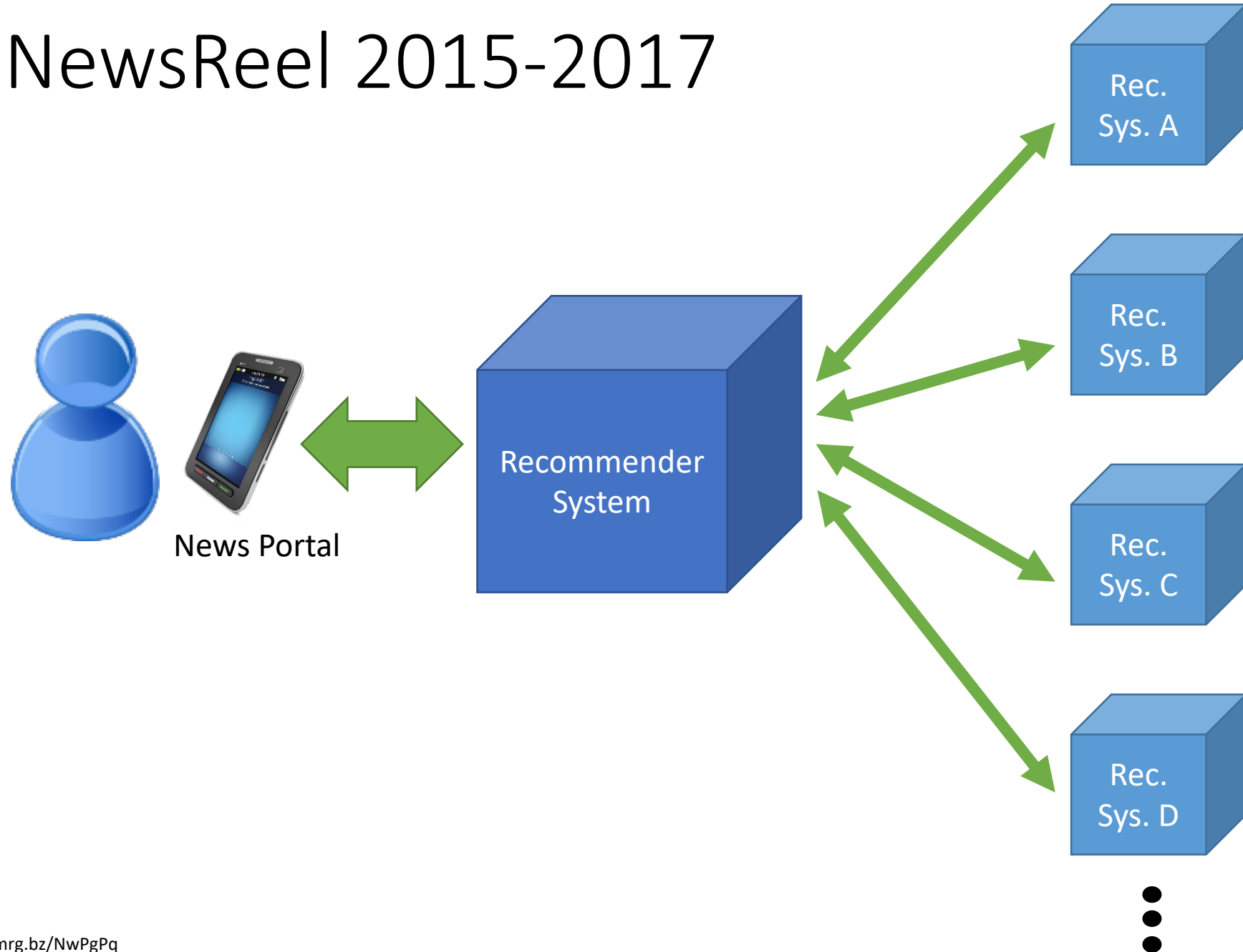




# Evaluation Phase



# CLEF NewsReel 2015-2017



# Evaluation-as-a-Service

Bringing the Algorithms to the Data

Tasks

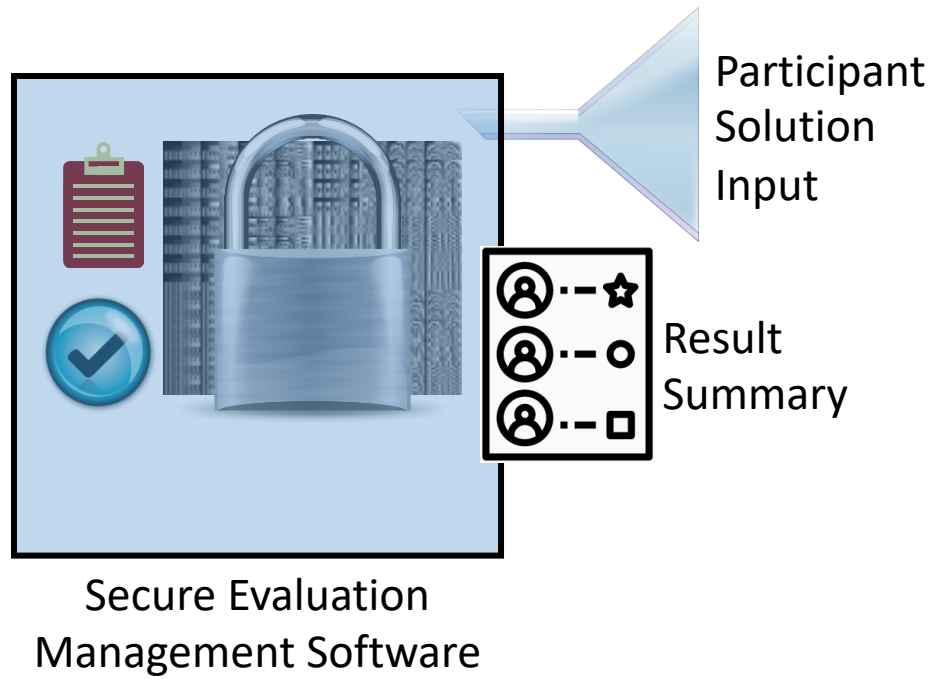


Ground  
truth



## Evaluation-as-a-Service Stakeholders

Data/Task Provider

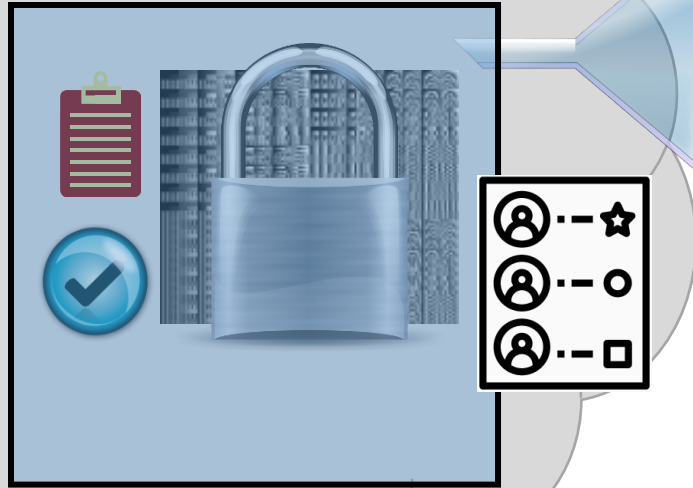


## Stakeholders

Data/Task Provider

Organiser

Cloud

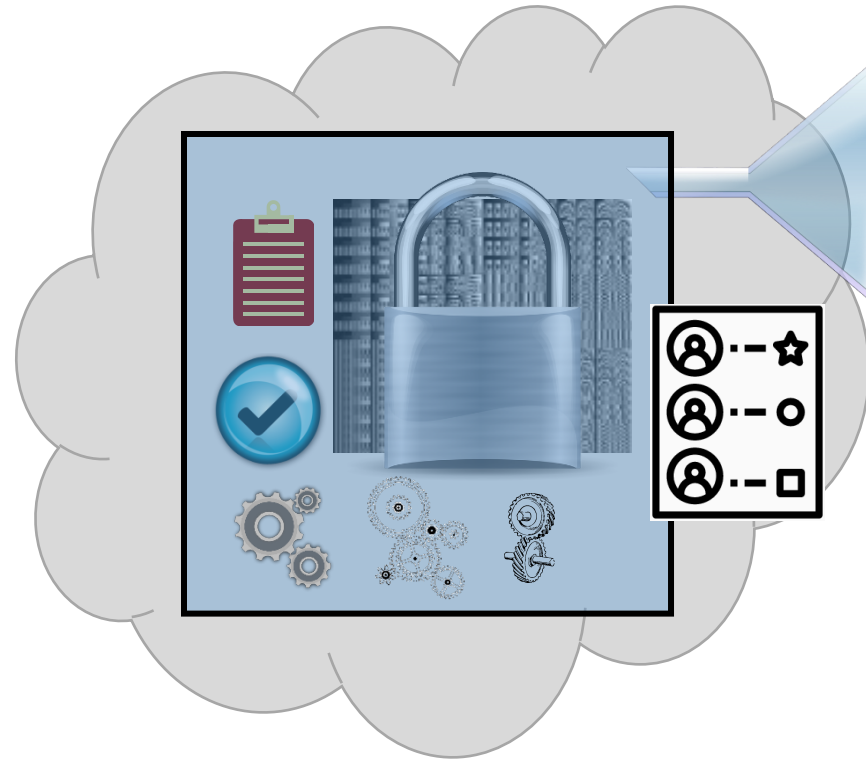


## Stakeholders

Data/Task Provider

Organiser

Infrastructure Provider



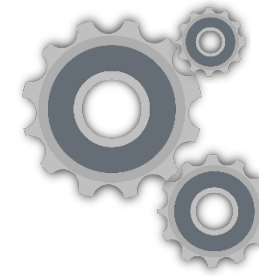
## Stakeholders

Data/Task Provider

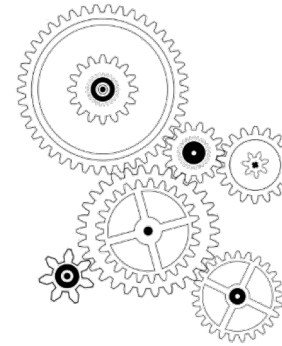
Organiser

Infrastructure Provider

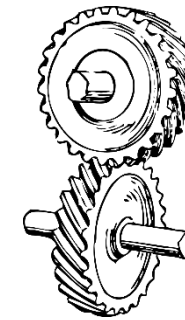
Participants



Participant 1  
solution



Participant 2  
solution



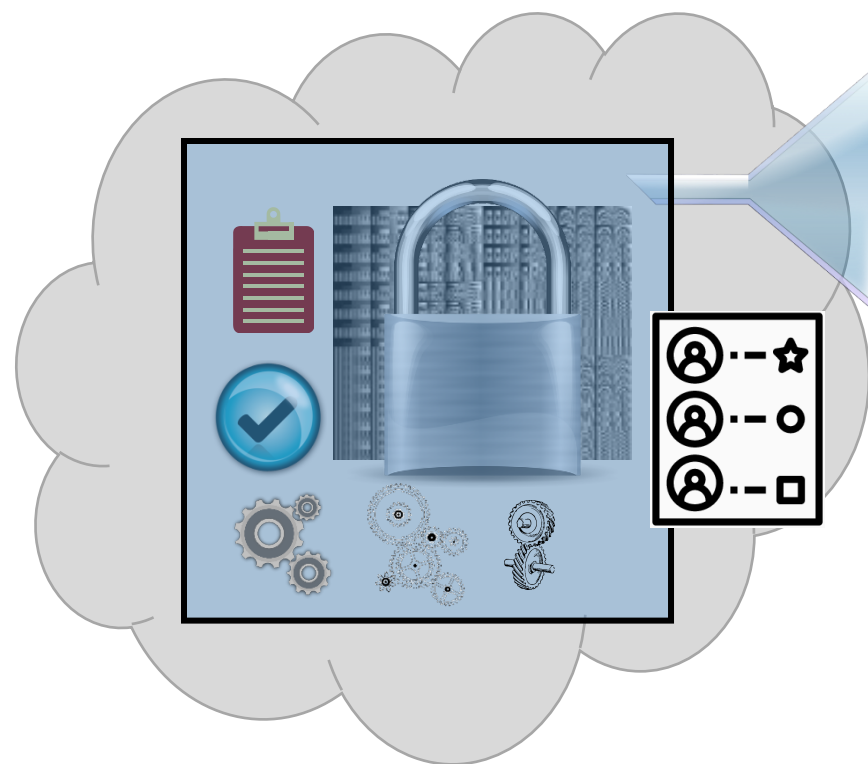
Participant 3  
solution

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<https://pixabay.com/vectors/gears-wheel-rotate-mechanical-37306/>

<https://thenounproject.com/term/leaderboard/2484528/>

<https://www.needpix.com/photo/download/29862/funnel-blue-flow-cone-liquid-fluid-tunnel-equipment-pour>



# Sustainability?

Data Repository

Code Repository

Publication



## **Evaluation-as-a-Service for the Computational Sciences: Overview and Outlook**

FRANK HOPFGARTNER, University of Sheffield

ALLAN HANBURY, TU Wien, Complexity Science Hub Vienna

HENNING MÜLLER and IVAN EGDEL, University of Applied Sciences Western Switzerland (HES-SO)

KRISZTIAN BALOG, University of Stavanger

TORBEN BRODT, plista GmbH

GORDON V. CORMACK and JIMMY LIN, University of Waterloo

JAYASHREE KALPATHY-CRAMER, Athinoula A. Martinos Center for Biomedical Imaging at Massachusetts General Hospital and Harvard Medical School

NORIKO KANDO, National Institute of Informatics

MAKOTO P. KATO, Kyoto University

ANASTASIA KRITHARA, National Center for Scientific Research “Demokritos”

TIM GOLLUB, Bauhaus-Universität Weimar

MARTIN POTTHAST, Leipzig University

EVELYNE VIEGAS, Microsoft Research

SIMON MERCER, Independent Consultant

# European Data Strategy

# A European Strategy for Data

The success of Europe's digital transformation over the next five years will depend on establishing effective frameworks to ensure trustworthy technologies, and to give businesses the confidence and means to digitise.



The [Data Strategy](#) and the [White Paper on Artificial Intelligence](#) are the first pillars of the new digital strategy of the Commission. They all focus on the need to put people first in developing technology, as well as on the need to defend and promote European values and rights in how we design, make and deploy technology in the real economy.

<https://ec.europa.eu/digital-single-market/en/european-strategy-data>

## The economic value of data sharing

- ◆ Data access and reuse can generate **social and economic benefits of 1% to 2.5%** of GDP<sup>1</sup>.
- ◆ The new measures could **increase the annual economic value** of data sharing by up to €7-11 billion by 2028<sup>2</sup>.
- ◆ In addition, the new rules will have a **wider impact on the EU economy and society** as a whole:



€ 1.3 trillion  
in increased productivity in  
**manufacturing** through  
**Internet-of-Things data** by 2027<sup>3</sup>



€ 120 billion  
of savings per year in the  
**EU health sector**<sup>4</sup>



**Health data:** Providing better healthcare, improving personalised treatments, helping cure rare or chronic diseases.



**Mobility data:** Saving more than 27 million hours of public transport users' time and up to €20 billion a year in labour costs of car drivers thanks to real-time navigation<sup>5</sup>.



**Environmental data:** Combatting climate change, reducing CO<sub>2</sub> emissions and fighting emergencies, such as floods and wildfires.



**Agricultural data:** Developing precision farming, new products in the agri-food sector or new services in rural areas.



**Public administration data:** Delivering better and more reliable official statistics, contributing to evidence-based decisions.

Ensure that the EU Data Strategy  
facilitates data access for science



# Informatics



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DIO  
Data Intelligence Offensive

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Informatics