



# Introduction to High Performance Machine Learning

17-18 June 2021

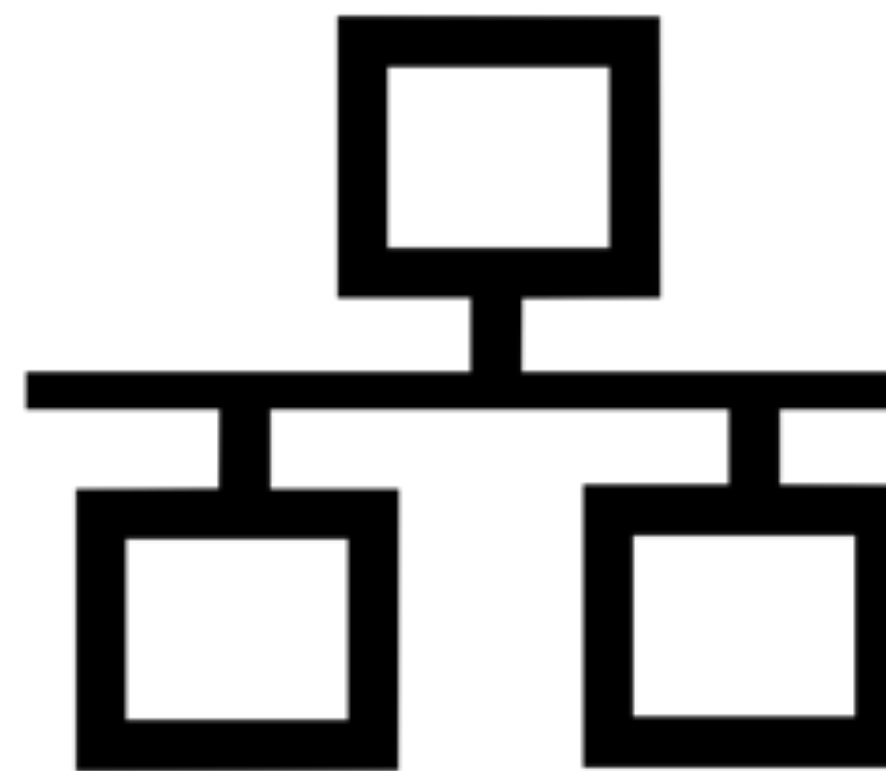
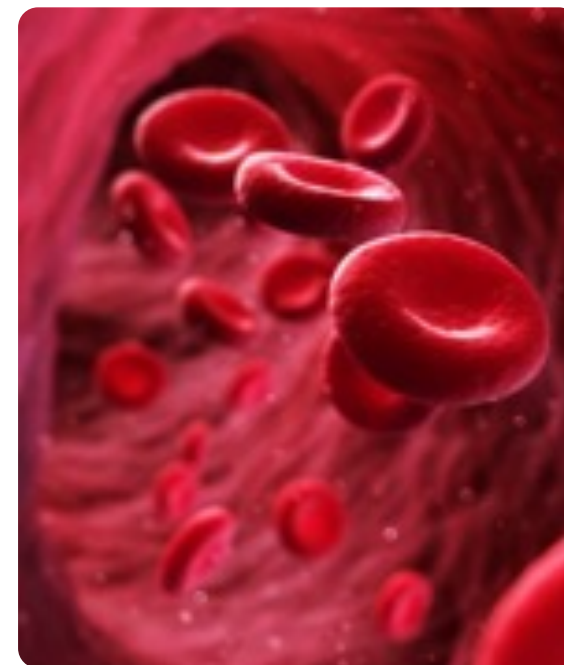
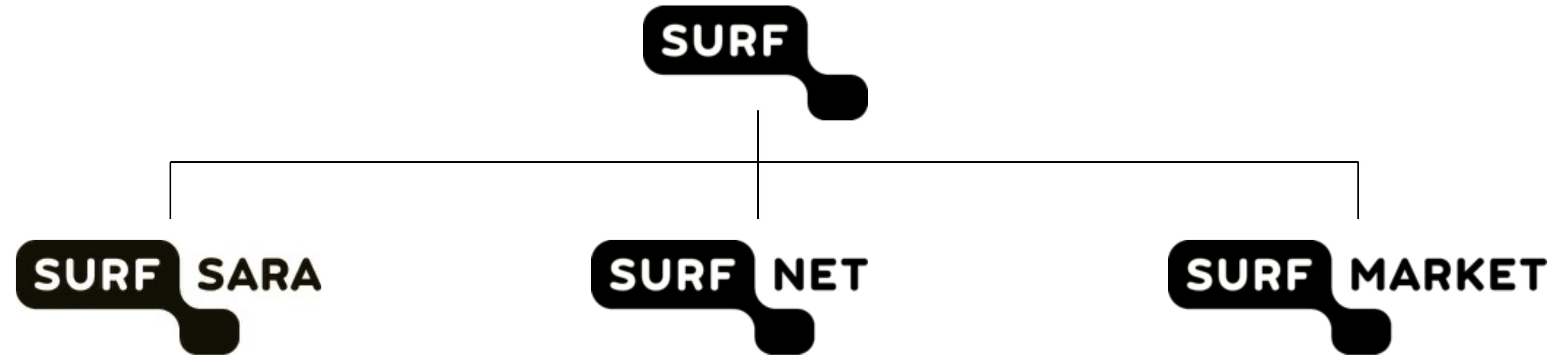
# About PRACE

## PRACE: Partnership for Advanced Computing in Europe

- Aims to enable high-impact scientific discovery and engineering research and development across all disciplines to enhance European competitiveness for the benefit of society.
- 26 Member countries.
- Missions:
  - Research Infrastructure
  - HPC Access
  - Training and Education
  - Mark Surveillance



# About SURF





# About SURF

**High performance  
computing**

**Supercomputing**

**Clustercomputing**

**Machine learning**

**HPC cloud**



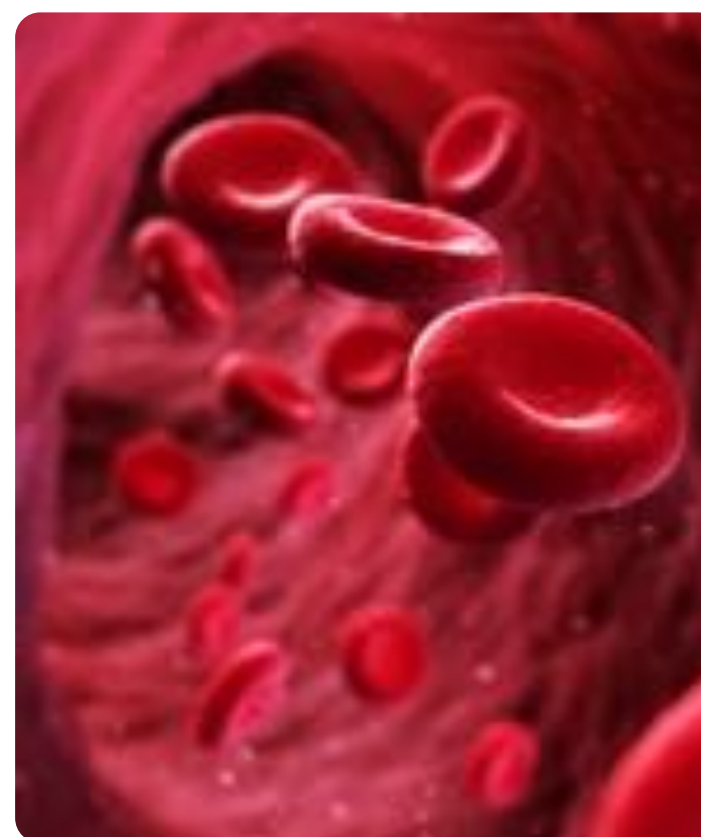
**Data processing**

**Data analytics**

**Grid services**

**Visualization**

**HPC cloud**



**Data services**

**Mass online storage**

**PID service**

**Data management**

**Data preservation**



# Objectives of the Workshop

- ➡ Understand the fundamental theories of machine learning and the intuitions/ideas behind the algorithms
- ➡ Work with a high-level machine learning API (`tf.keras`)
- ➡ Explore hyperparameter space to improve a neural network
- ➡ Understand the pitfalls of classic machine learning algorithms
- ➡ Upscale large machine learning models with parallel training on a supercomputer

# Schedule (17 June 2021)

What	When	Who
Welcome & Introduction	09:00 - 09:15	Maxwell Cai
Introduction to neural networks	09:15 - 09:45	Maxwell Cai
Hands-on: Neural Networks (with MNIST)	09:45 - 10:30	Maxwell Cai
Coffee Break	10:30 - 11:00	
Neural Networks: knobs and dials	11:00 - 11:30	Joris Mollinga
Hands-on: Hyperparameter tuning for optimizing the MNIST prediction	11:30 - 12:00	Joris Mollinga
Lunch Break	12:00 - 13:30	
Introduction to CNNs, RNNs, and generative models	13:30 - 14:30	Maxwell Cai
Hands-on: CNNs with CIFAR	14:30 - 15:15	Maxwell Cai
Coffee Break	15:15 - 15:45	
DNN inspection and result Interpretation	15:45 - 16:30	Maxwell Cai
Open Discussion	16:30 - 17:00	

# Schedule (18 June 2021)

What	When	Who
Introduction to Parallel Computing	09:00 - 09:30	Caspar van Leeuwen
Parallel Computing for Deep Learning: basic ideas, algorithms, frameworks, and hardware bottleneck.	09:30 - 10:30	Caspar van Leeuwen
Coffee Break	10:30 - 11:00	
Structure of Deep Learning Frameworks: computational graph, autodiff, and optimizers	11:00 - 11:30	Joris Mollinga
Hands-on: Profiling TensorFlow with TensorBoard	11:30 - 12:30	Caspar van Leeuwen
Lunch Break	12:30 - 14:00	
Hands-on: Data Parallelism with Horovod (CIFAR10)	14:00 - 15:00	Joris / Maxwell
Coffee Break	15:00 - 15:30	
Introduction to hybrid parallelism	15:30 - 16:15	Caspar van Leeuwen
Open Discussion	16:15 - 17:00	

## **Slack channel**

<https://app.slack.com/client/T01CDNDSFMG/C0257M0163C>



**“Hop in, hop off”**