

# Data Systems Group

Presentation to ENS Paris-Sarclay

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MAX PLANCK INSTITUTE  
FOR SOFTWARE SYSTEMS

# My Research: Next-Gen Big Data Systems



The Data Revolution puts Big Data systems under strain!

Hard to support new requirements and use cases

## Data Volume



**Scalability**

**Maximize**  
Performance / Utilization

## Data Velocity



**Interactivity**

**Provide**  
Low-Latency Results

## Workload & Data Variety



**Autonomy**

**Automate**  
Performance Tuning

# Benchmarking “Learned” Systems

**Learned Systems use Machine Learning (ML) to synthesize new components (e.g., index, query optimizer) => major performance gains**

**Problem:** how can we trust that a learned system works?

- ▶ Benchmarking (show improvements, avoid regressions)
- ▶ Adversarial workloads that will “break” the ML models



Synthesize data&workloads from real-world deployments



Build a benchmark that incorporates new workloads and metrics



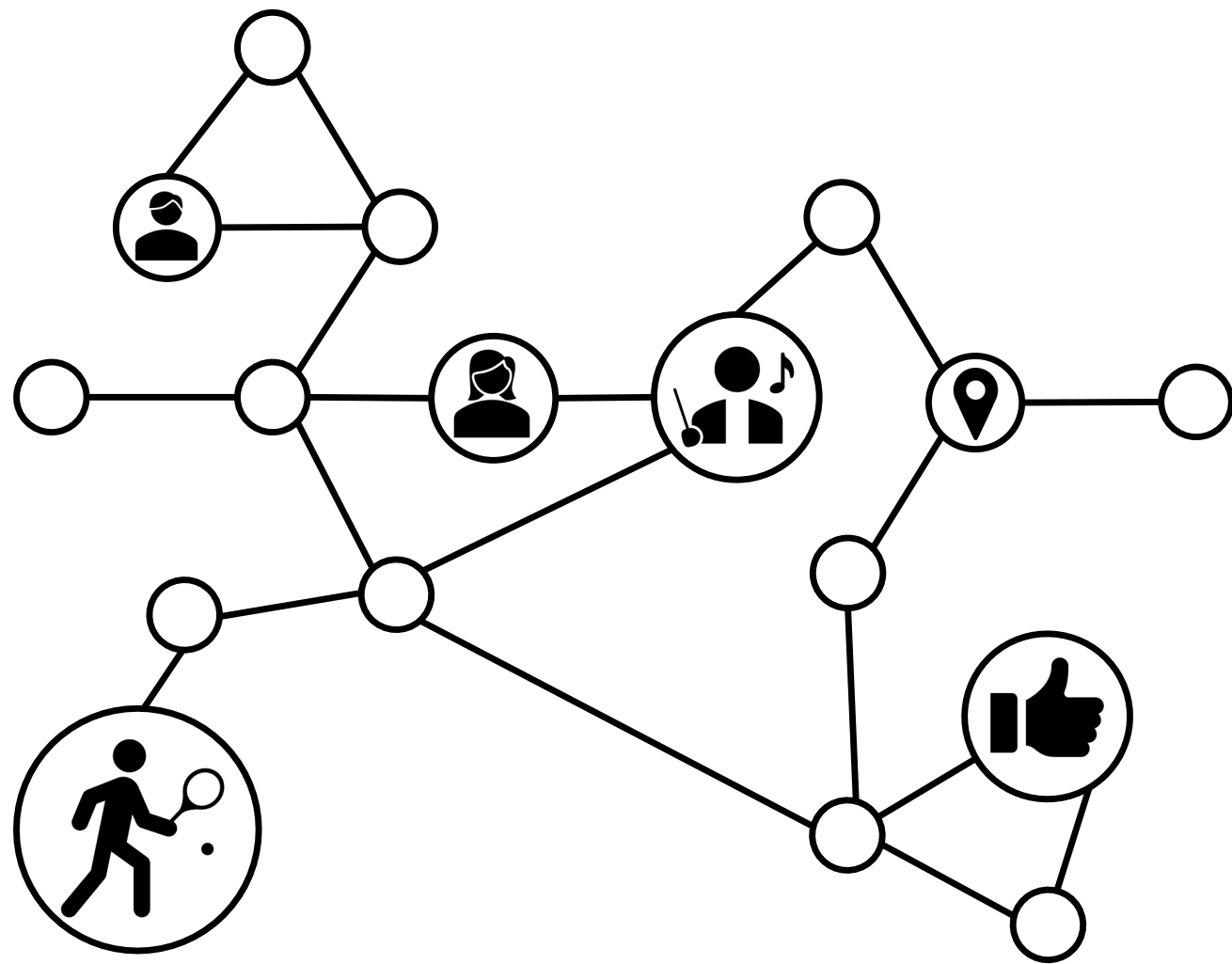
Automatically generate adversarial workloads





# Anomaly Detection in Dynamic Graph Datasets

Find outliers (e.g., surprising patterns)  
in fast-changing graphs



## Applications

Network intrusion detection  
Financial fraud detection  
Failure troubleshooting  
Law/customs enforcement  
Event detection in IoT sensors  
“Fake” news identification

- ? What system architecture given millions of updates per second?
- ? How to define what is “normal” and “abnormal”? (API)
- ? How to deal with noise and present usable results?

# Ingestion & Storage of Satellite Imagery

SCALABILITY

INTERACTIVITY

AUTONOMY

Image  
Streams

Cleaning &  
Pre-processing

## Applications

Agriculture  
Climate  
Navigation  
Disasters  
Weather  
Infrastructure  
Military  
...

Image Recognition

Indexing

Storage  
Engine

Multi-modal Data

OSINT Integration

Queries

?

Caching

?

Materialization

?

Compression

?

Archival

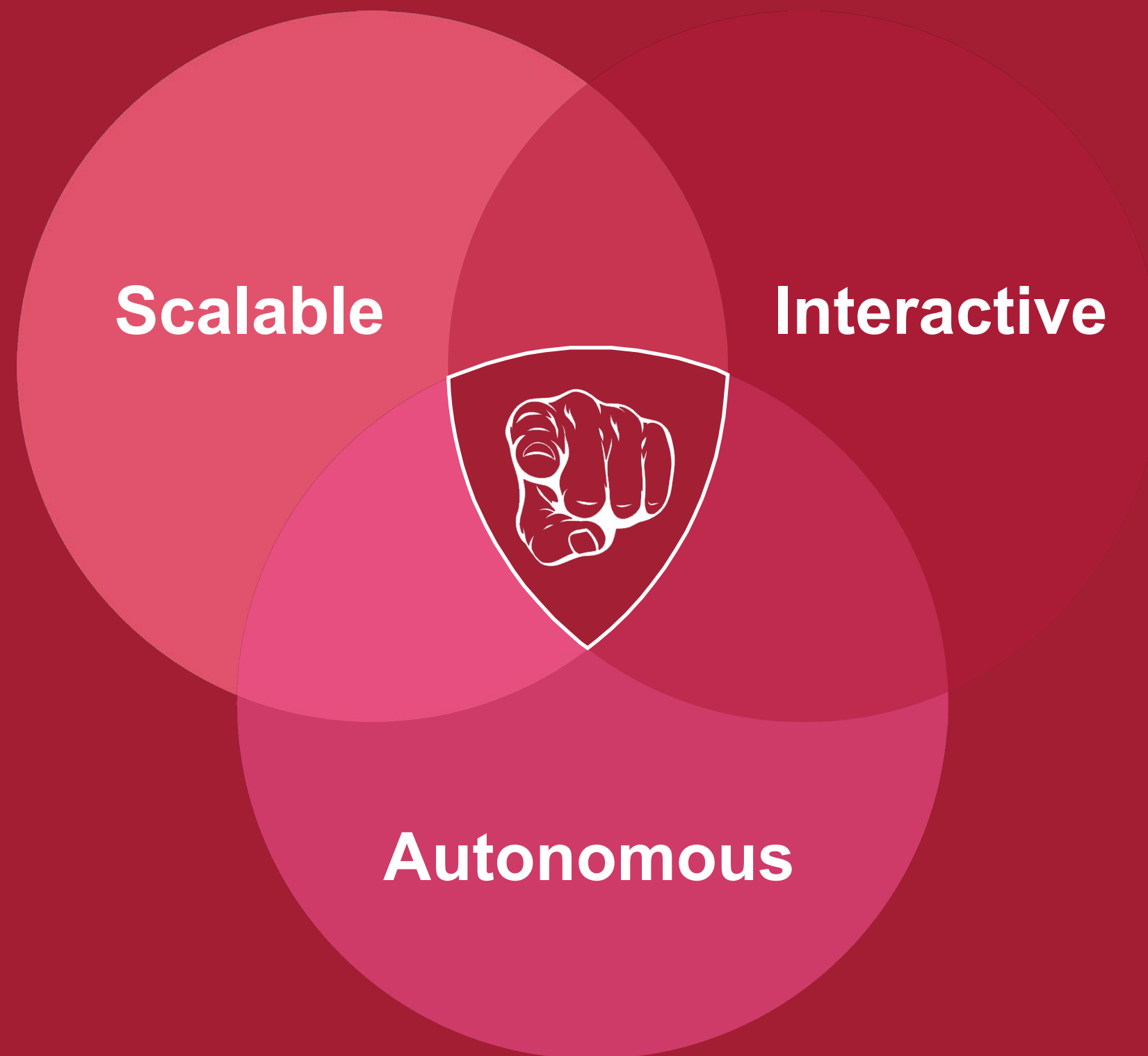


# Collaborators





# I am looking for motivated interns/students!



Please reach out!

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**JE PARLE**  
*Français*