Seminar course
Modern Data Center Systems
(aka "sys-seminar")
Preliminary meeting
https://dse.in.tum.de/

Prof. Pramod Bhatotia

About me

- Professor at TUM (Sept 2020 - present)
    - Chair of Decentralized Systems Engineering
    - **Interests:** distributed systems, operating systems, security and reliability

- Faculty at UoE
    - Professor (Jan 2021 - present)
    - Associate Professor (Oct 2016 - Dec 2020)

- Industry experience
    - Technical Director at Huawei Research Germany (Jan 2019-Aug 2020)
    - Past affiliations: IBM Research, Bell Labs, Microsoft Research, Yahoo! Labs

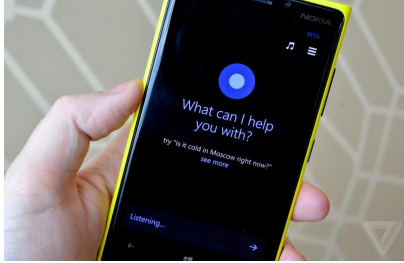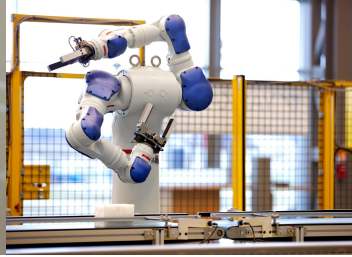- PhD at Max Planck Institute for Software Systems (MPI-SWS)

Three important trends

Data-driven intelligent applications

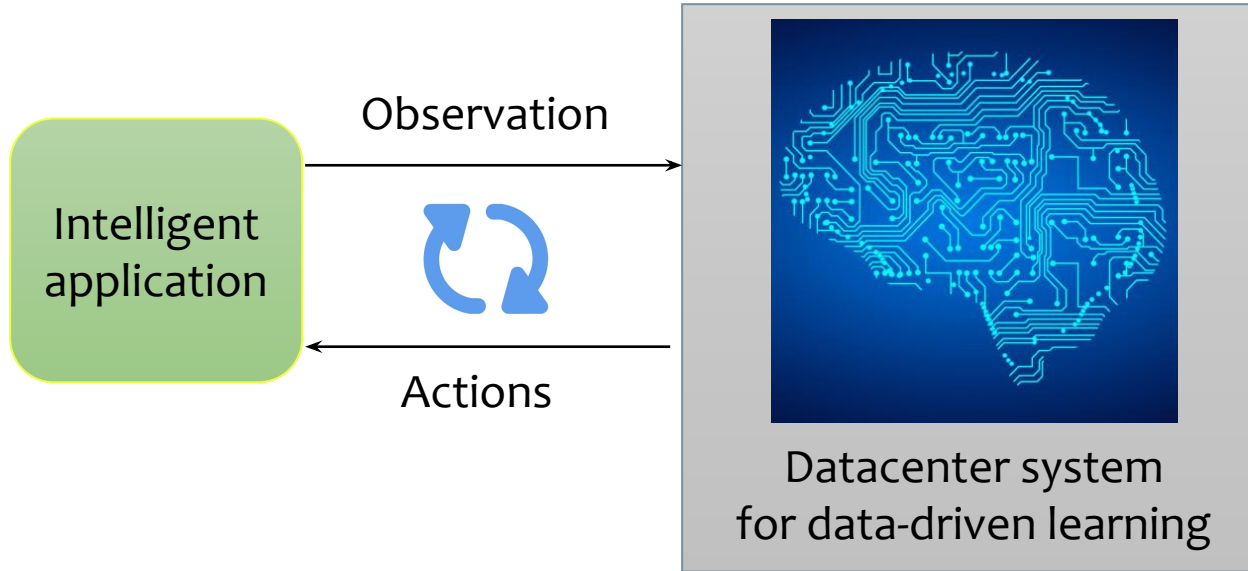# Intelligent applications

Consumer devices

Manufacturing

Healthcare

Logistics

Transportation

Defense

System design

Observation

Intelligent application

Actions

Datacenter system
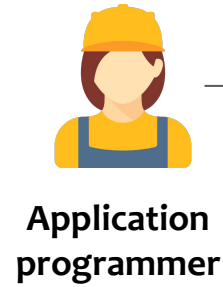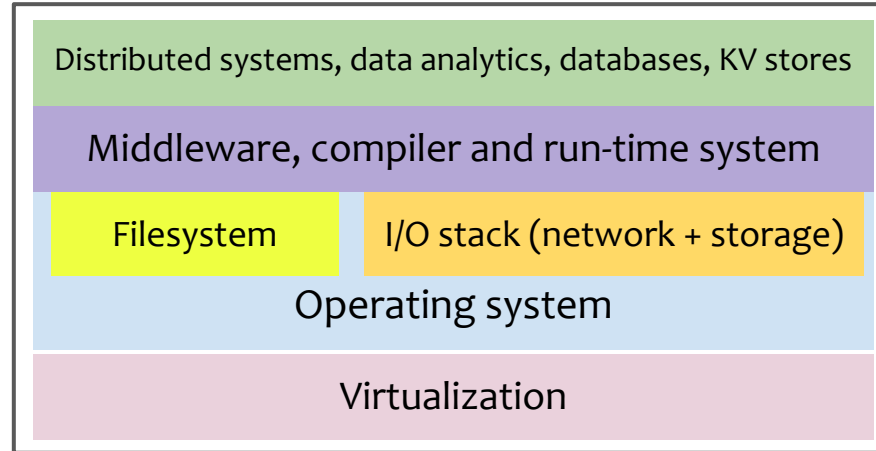for data-driven learning

Need high-performance computing infrastructure

System stack

Design, build & deploy →

Application programmer

Applications

Distributed systems, data analytics, databases, KV stores

Middleware, compiler and run-time system

Filesystem

I/O stack (network + storage)

Operating system

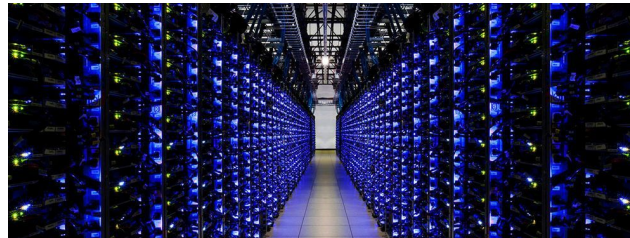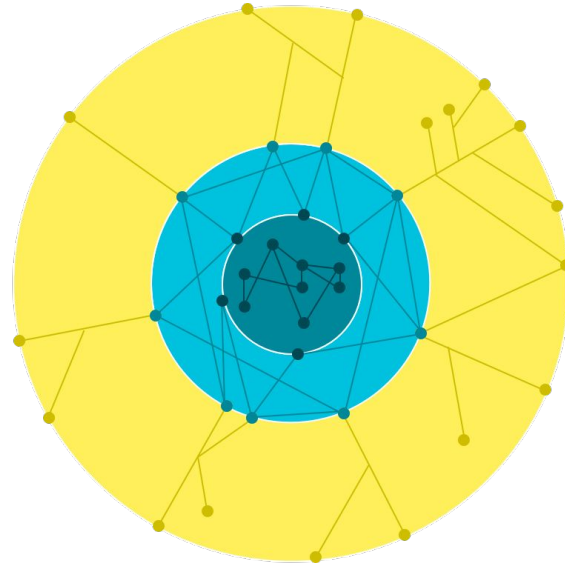Virtualization

Data center systems

100s-1000s of machines

The computing landscape

Core data centers

Edge Points of Presence (PoPs)

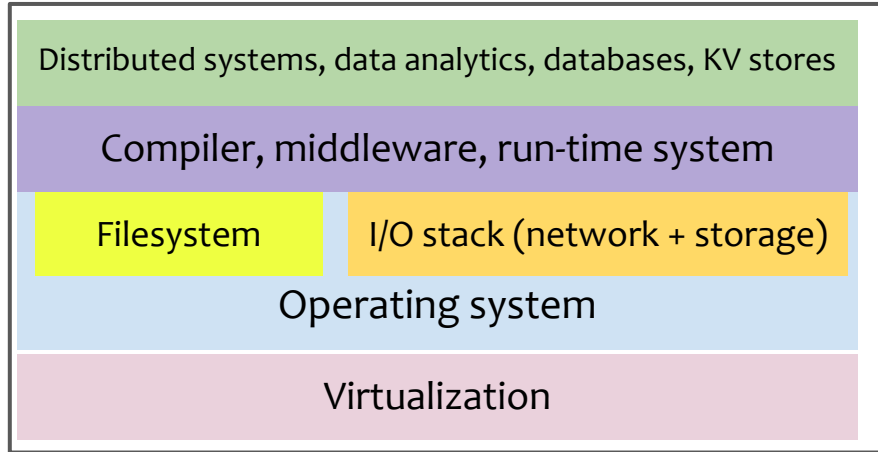Edge caching and services nodes (Google Global Cache, or GGC)

Source: https://peering.google.com/#/

System stack

Applications

Distributed systems, data analytics, databases, KV stores

Compiler, middleware, run-time system

Filesystem

I/O stack (network + storage)

Operating system

Virtualization

Data center systems

Scalability
Performance
Reliability
Security
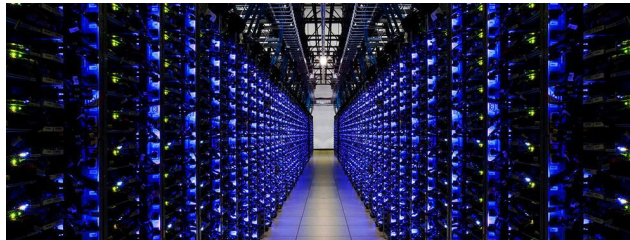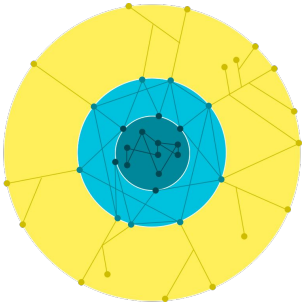
Bird's eyes view

Team
(2 students per team)

Research papers
(Top systems conferences)

Understand

Research ideas

1 presentation

1 short report

Peer-reviewing

Overview

Phase I

Phase II: Understand & explore

Phase III: Research

Phase IV: Report & review

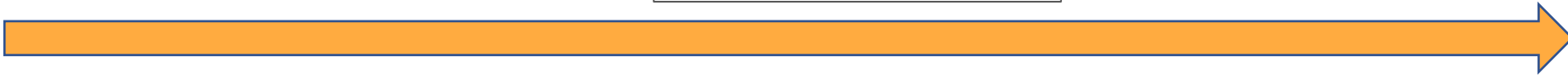| Kick-off | Understand | Presentation | Design | Implement (Bonus) | Report | Peer-review |

Phase I: Kick-off meeting

Format and motivation
(all participants meeting)

Team formation
(2 students per team)

Paper selection
(Top systems conferences)

The first week

NOTE
1. A list of papers will be provided for FCFS bidding
2. Paper presentation guidelines will be provided for the next phase

Phase II: Understand & explore

Understand the paper(s)

Focus
1. **Understand** the paper and related work
2. Also **explore** a "laundry list" of research ideas/directions

Paper presentation

Focus
1. Explain the work/related work (**"why?"** and **"how?"**)
2. Explain and discuss all possible research directions
3. Pick a research direction

Phase III: Research

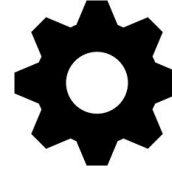**Research work**

Research prototype

Focus:
Indepth research work to nail-down the problem and detailed approach to solve it!

Bonus:
(Optional)
"Build the system to solve it!" and show us the working idea and associated results

Phase IV: Report & review

Report

Focus

Prepare a single "short & sweet" report summarizing
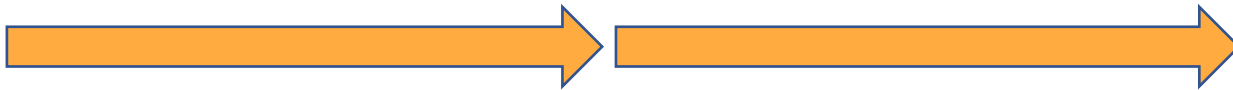(a)   Paper
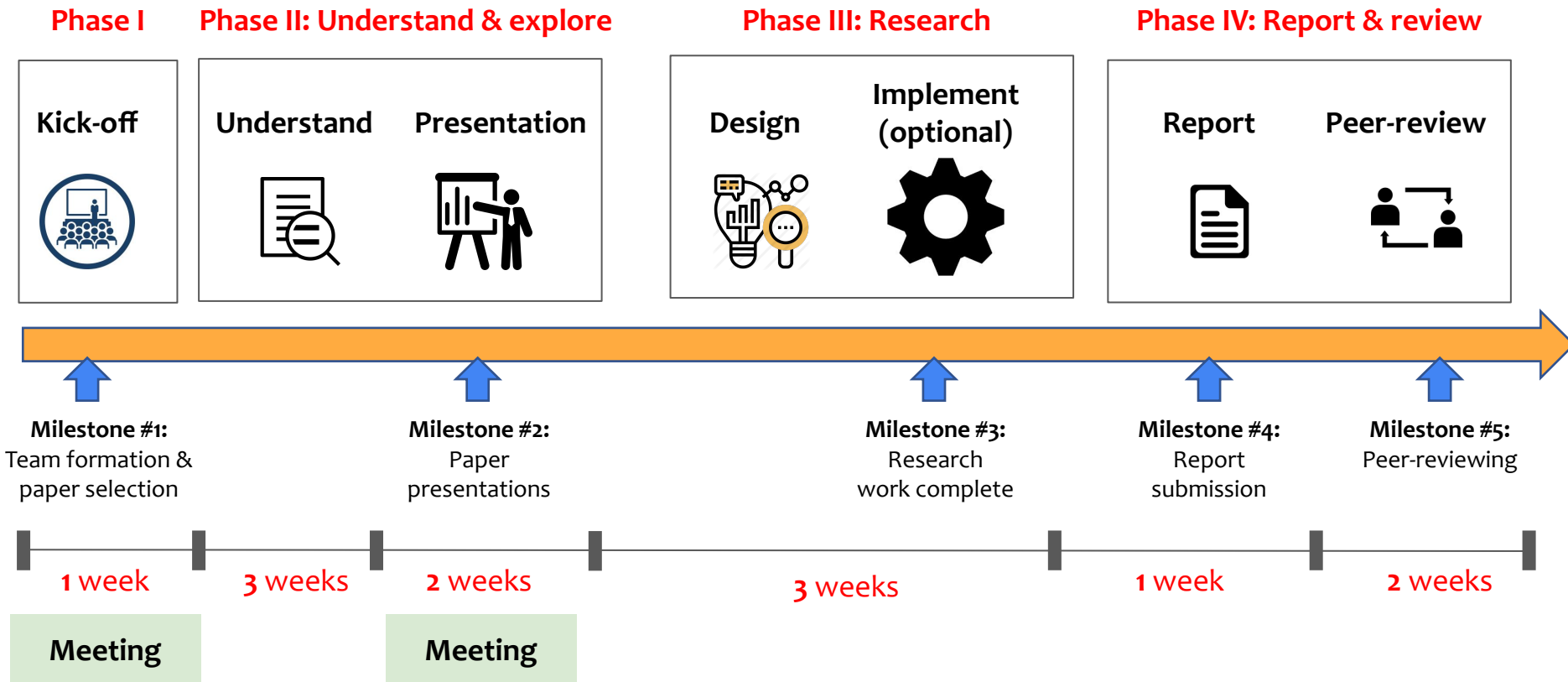(b)   Research work

Peer-review

Focus

Give constructive (positive and critical) feedback for
(a)   Paper summary
(b)   Research work

END.

Overall timeline

Phase I **Phase II: Understand & explore** **Phase III: Research** **Phase IV: Report & review**

Kick-off Understand Presentation Design Implement (optional) Report Peer-review

Milestone #1:
Team formation & paper selection

Milestone #2:
Paper presentations

Milestone #3:
Research work complete

Milestone #4:
Report submission

Milestone #5:
Peer-reviewing

1 week **3** weeks **2** weeks **3** weeks **1** week **2** weeks

Meeting **Meeting**

Organization

- Format
    - Team-based seminar course (2 students per team)
- Communication
    - Slack for announcements and information sharing
    - Hotcrp for report submission and peer-reviewing
- Meetings
    - **Meeting #1:** Kick-off
    - **Meeting #2:** Paper presentation

Learning goals

- Learn about the cutting-edge research in computer systems
- Promote critical thinking
- Cultivate an environment for innovation
    - To push the boundaries by advancing the state-of-the-art
- Improve scientific skills
    - Presentation
    - Writing
    - Communication: discussion and arguing
    - Mentorship: giving feedback and moderating discussion
- Encourage system building and evaluation
    - Learn by building, breaking, and benchmarking systems
- Importantly, to have fun!

Code of conduct

- University plagiarism policy
    - https://www.in.tum.de/en/current-students/administrative-matters/student-code-of-conduct/

- Decorum
    - Promote freedom of thoughts and open exchange of ideas
    - Cultivate dignity, understanding and mutual respect, and embrace diversity
    - Racism and bullying will not be tolerated

Interested?

TLM

Sign up on the TUM matching platform

Contact

- Prof. Pramod Bhatotia
    - pramod.bhatotia@in.tum.de

Workspace: http://ls1-courses-tum.slack.com/

Channel: # will be announced separately

Join us with TUM email address (@tum.de)

Website: https://dse.in.tum.de/