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Analysis and control of large-scale network systems

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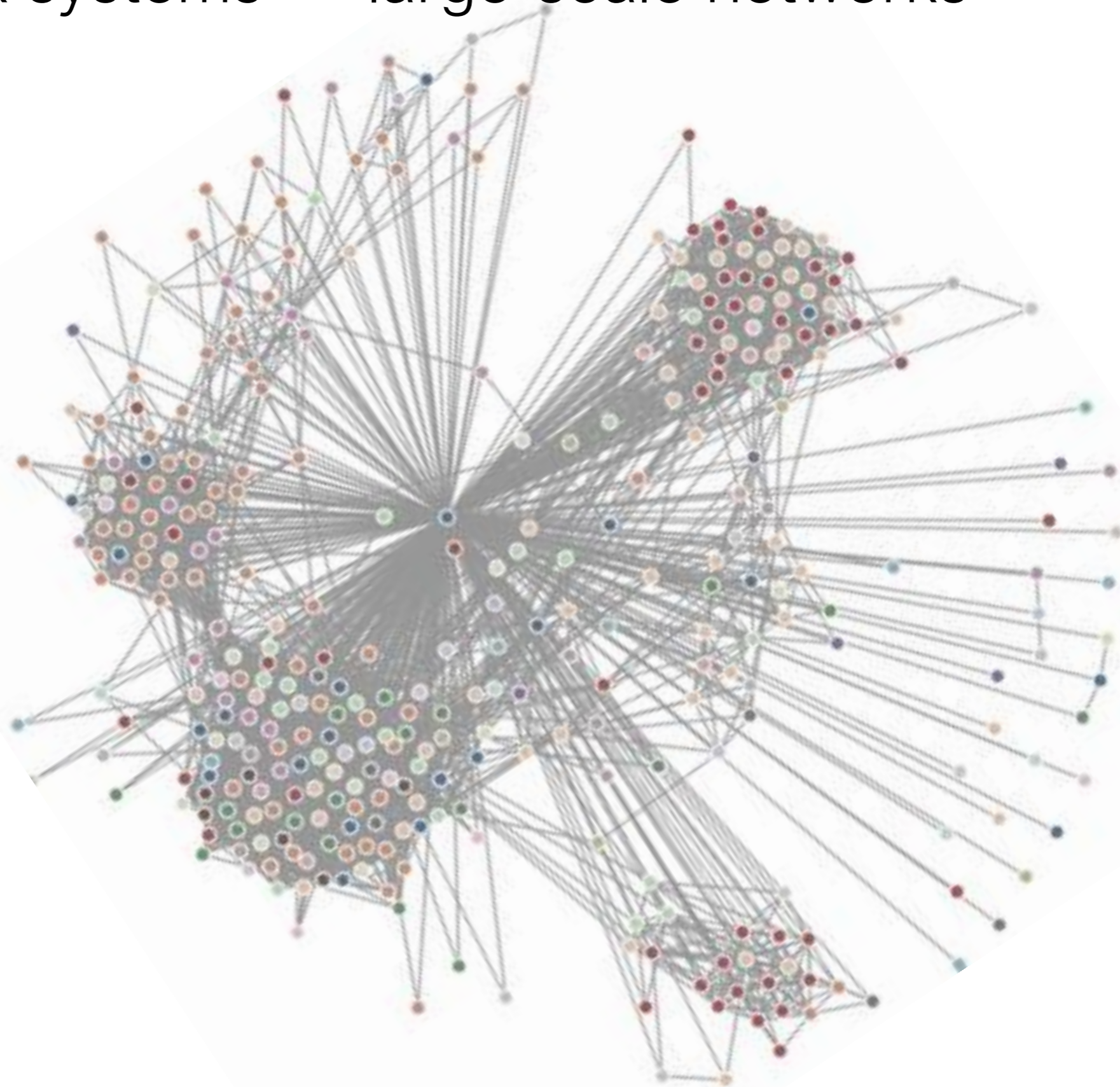
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WASP | WALLENBERG AI,
AUTONOMOUS SYSTEMS
AND SOFTWARE PROGRAM

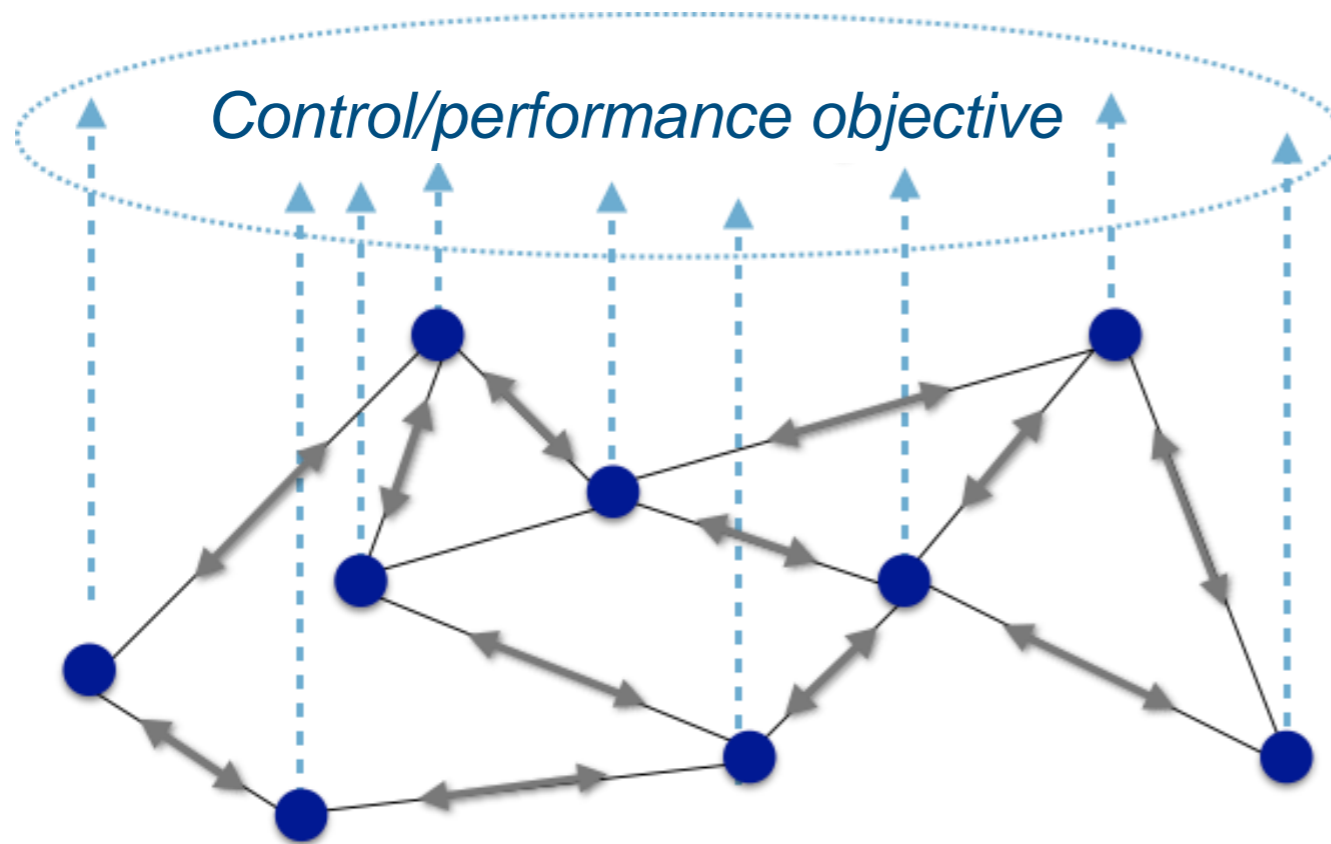


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Complex systems — large-scale networks



Distributed control: local control, global objectives

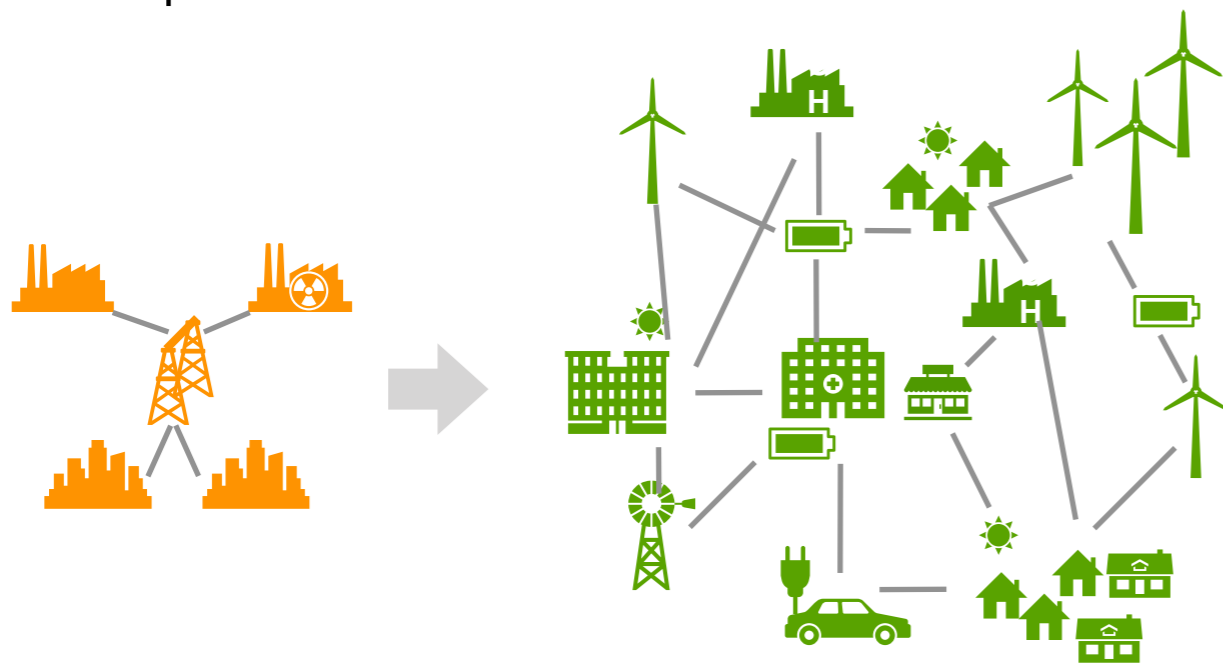


- Network structure poses a difficult constraint
- Undesirable large-scale behaviors and fragilities are common

Distributed control is subject to fundamental limitations

Can we allow networks to grow (very) large while maintaining control performance?

Examples:



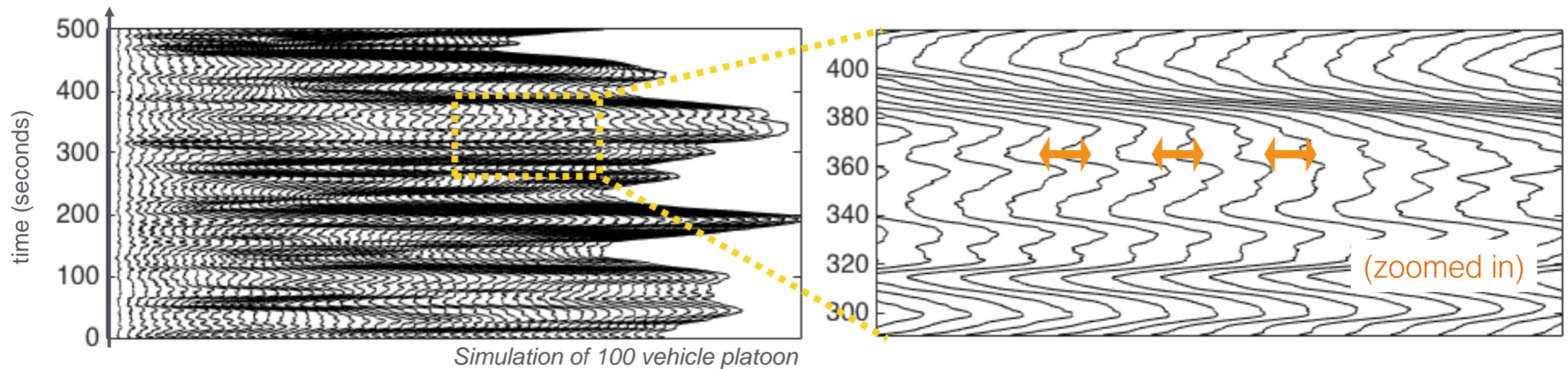
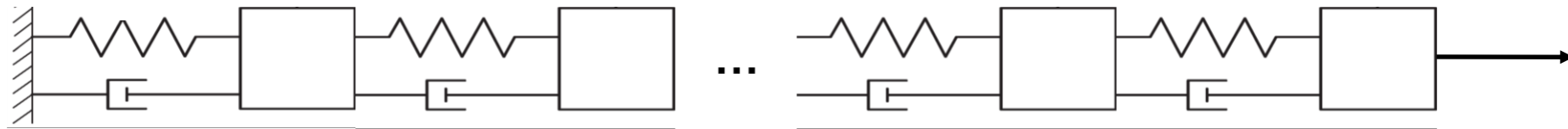
- Highly distributed power generation (smart grid)



- Platooning / adaptive cruise control

Distributed control is subject to fundamental limitations

Model:



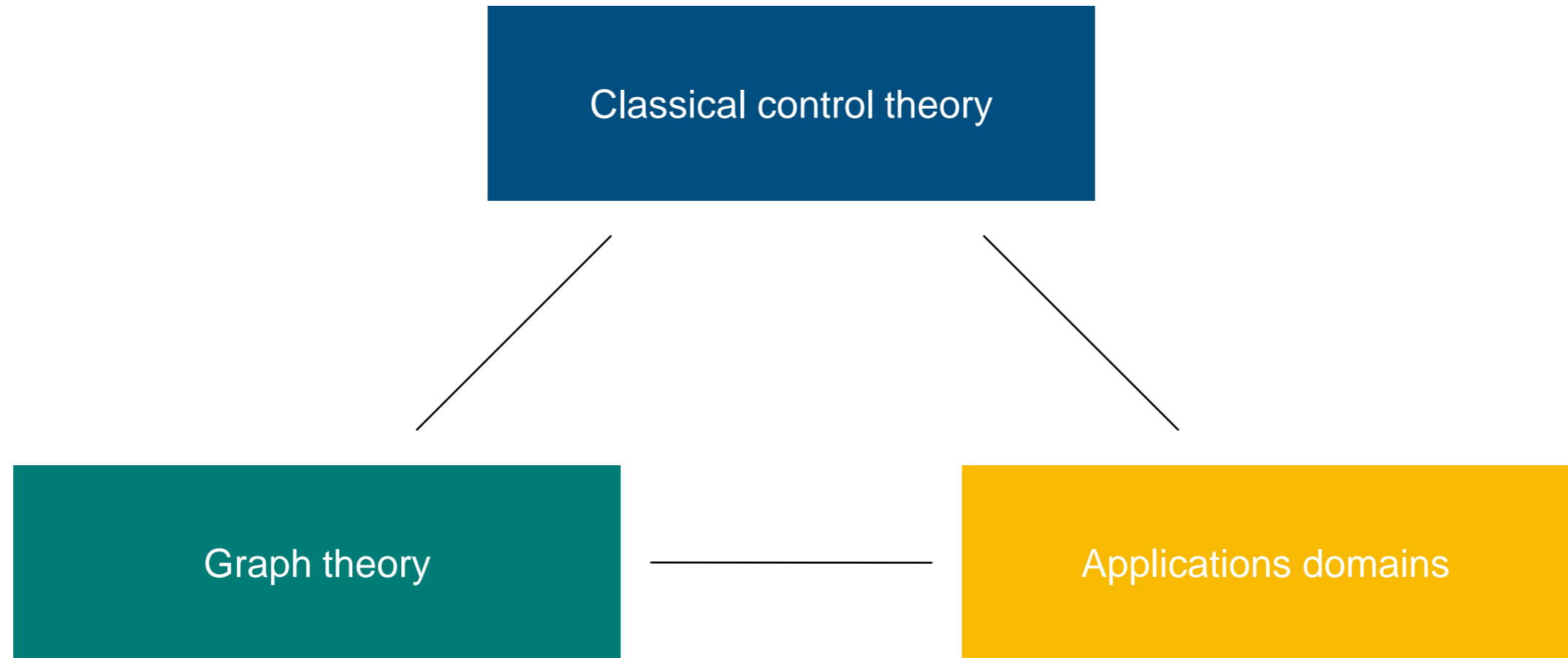
- System exhibits large-scale modes that cannot be controlled locally
- Scalable performance requires highly interconnected network, or alternative control mechanisms



Classical control theory

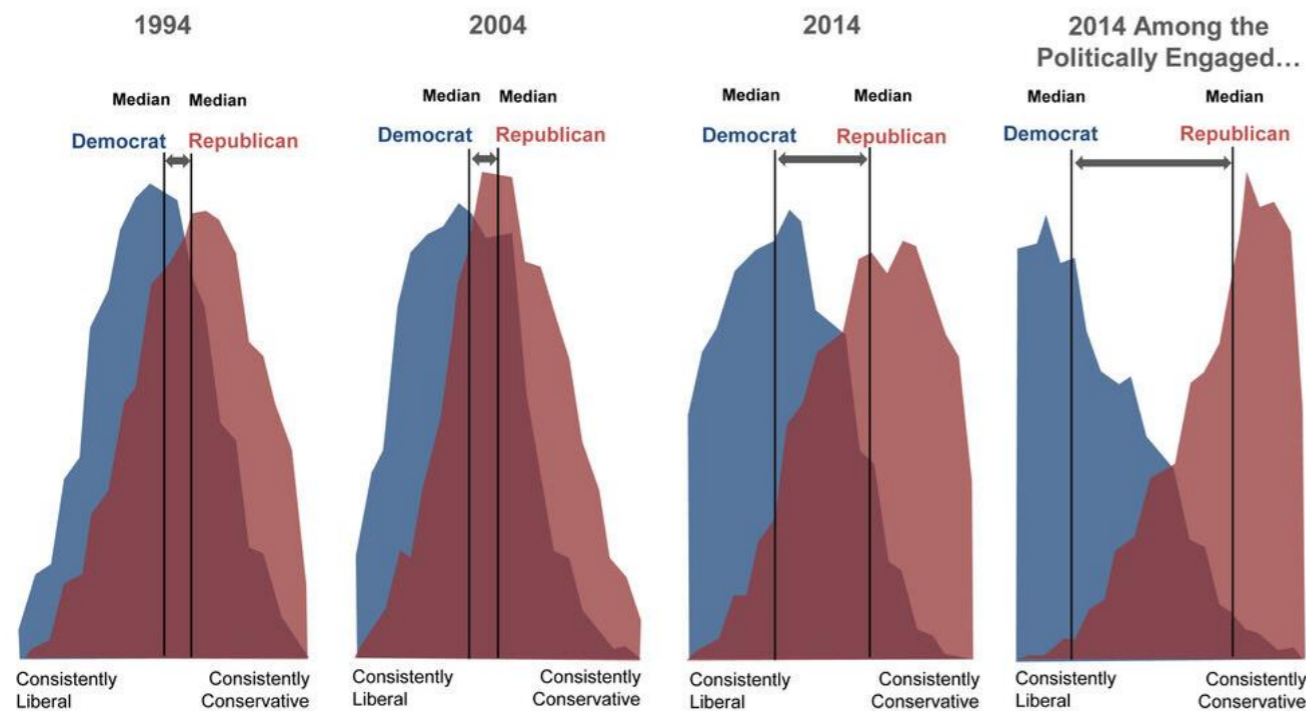
Graph theory

Applications domains



New challenges in sociotechnical network systems

Global phenomena — local interactions — complex networks

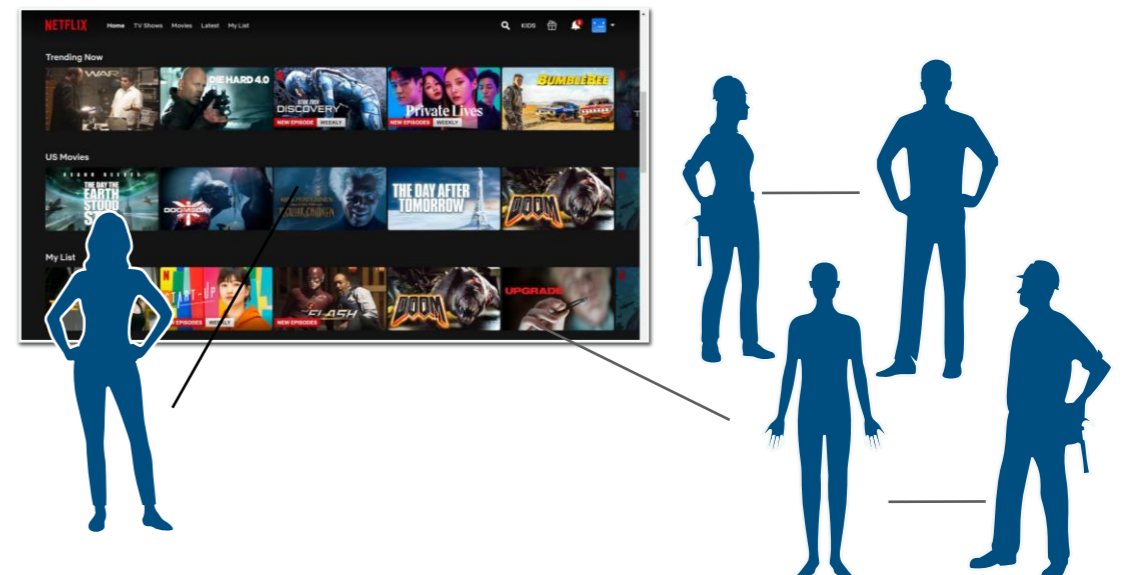


- Political polarization /opinion and belief dynamics

ELLIIT, Altafini and Tegling

- Hidden network structures in intermediation platforms

WASP NEST, Proutiere, Rantzer, Skerman and Tegling



Thank you!

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