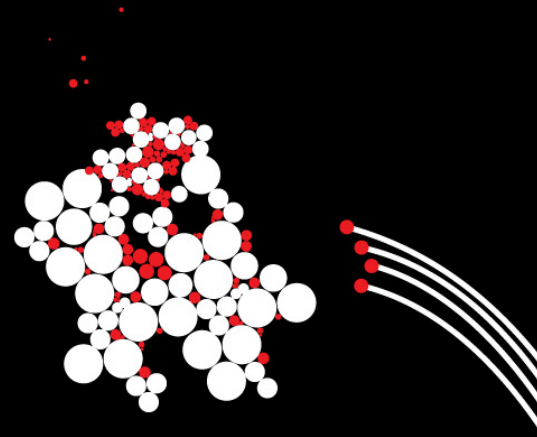
UNIVERSITY OF TWENTE.

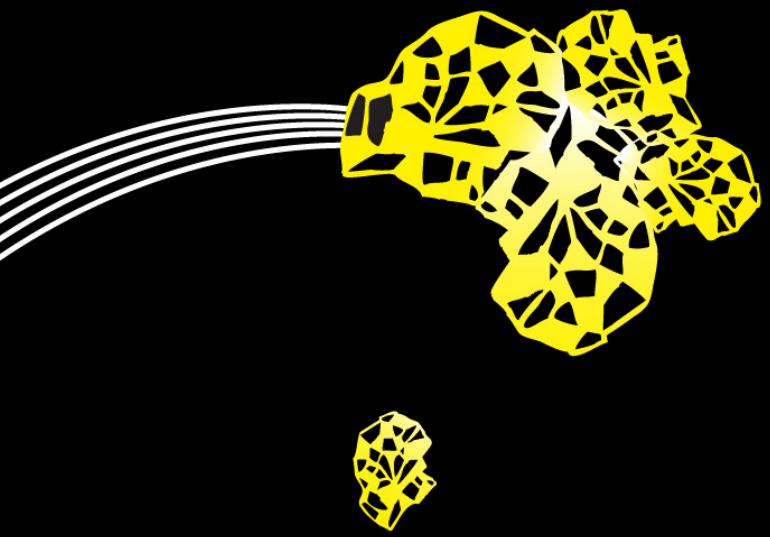


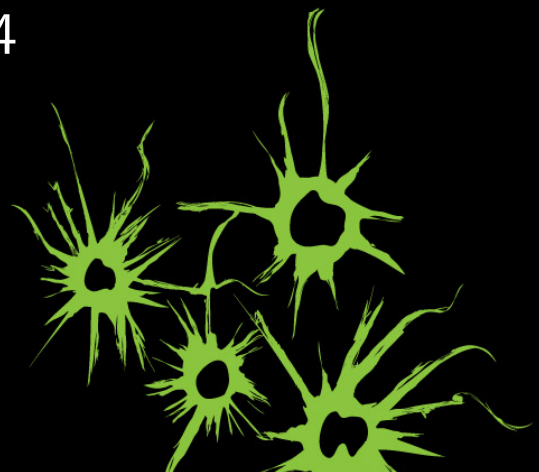
Setting parameters for biological models with ANIMO

Stefano Schivo, Jetse Scholma, Marcel Karperien, Janine N. Post, Jaco van de Pol, Rom Langerak

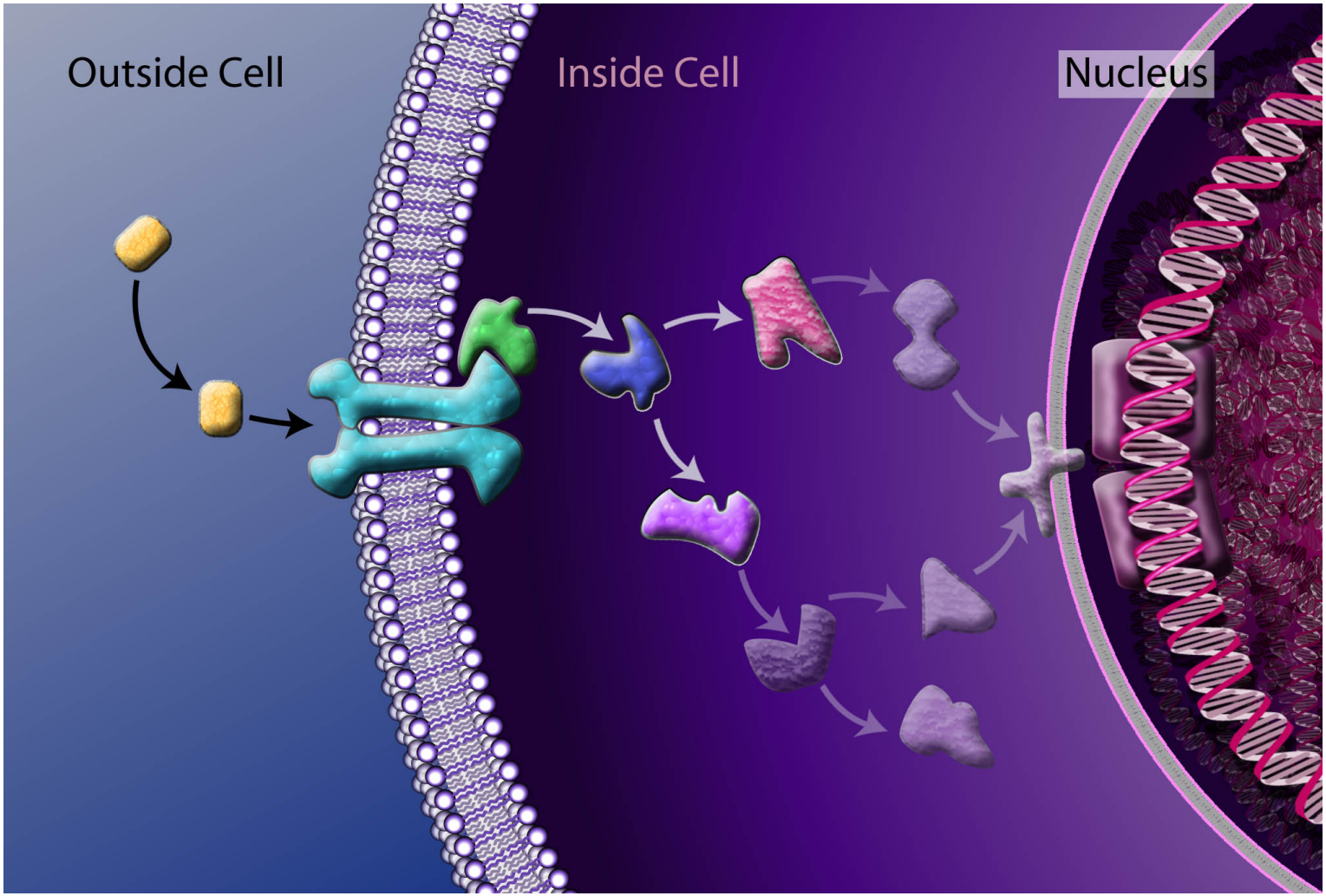
University of Twente, Enschede, The Netherlands

SynCoP 2014



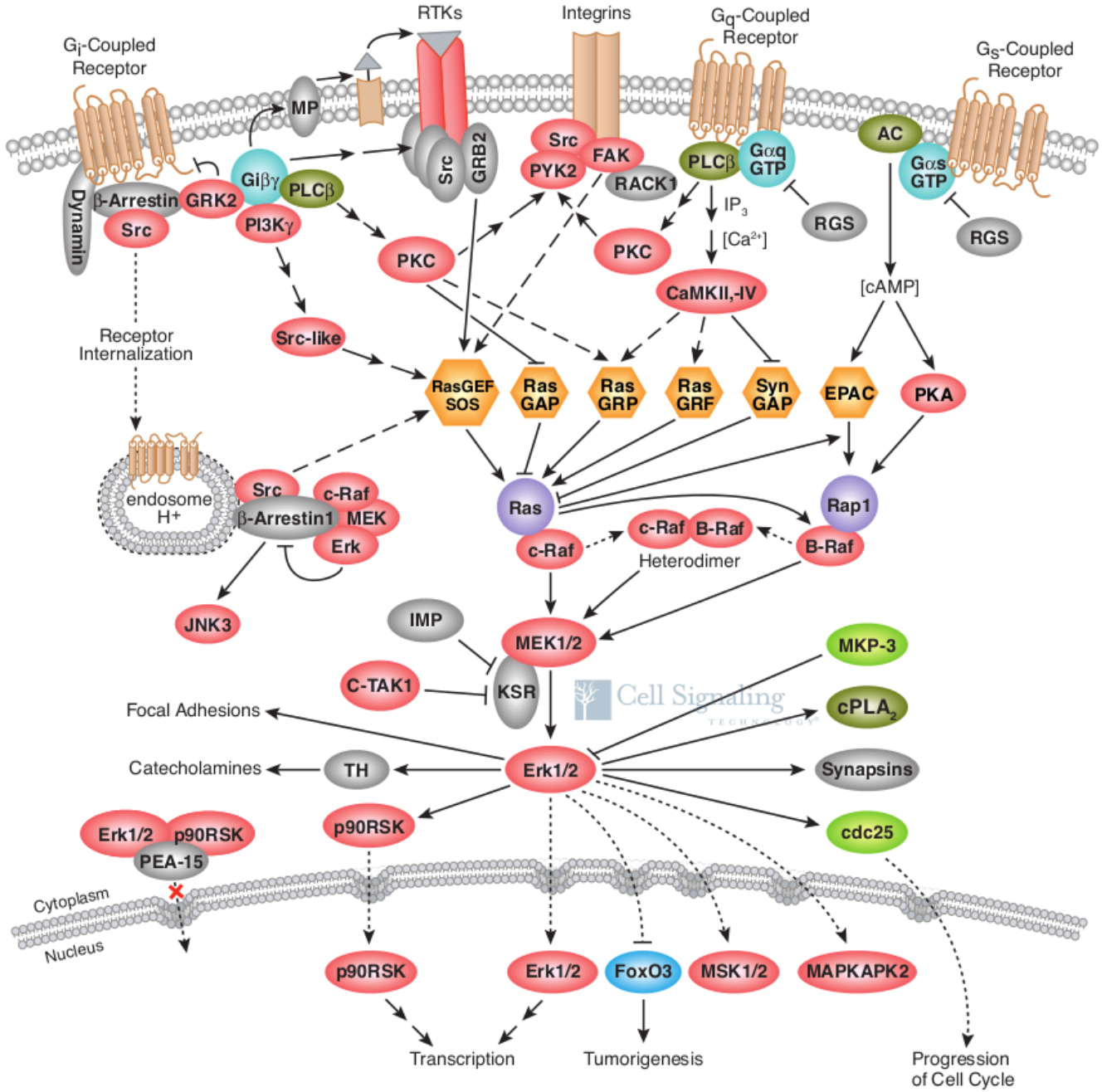


Signalling Pathways



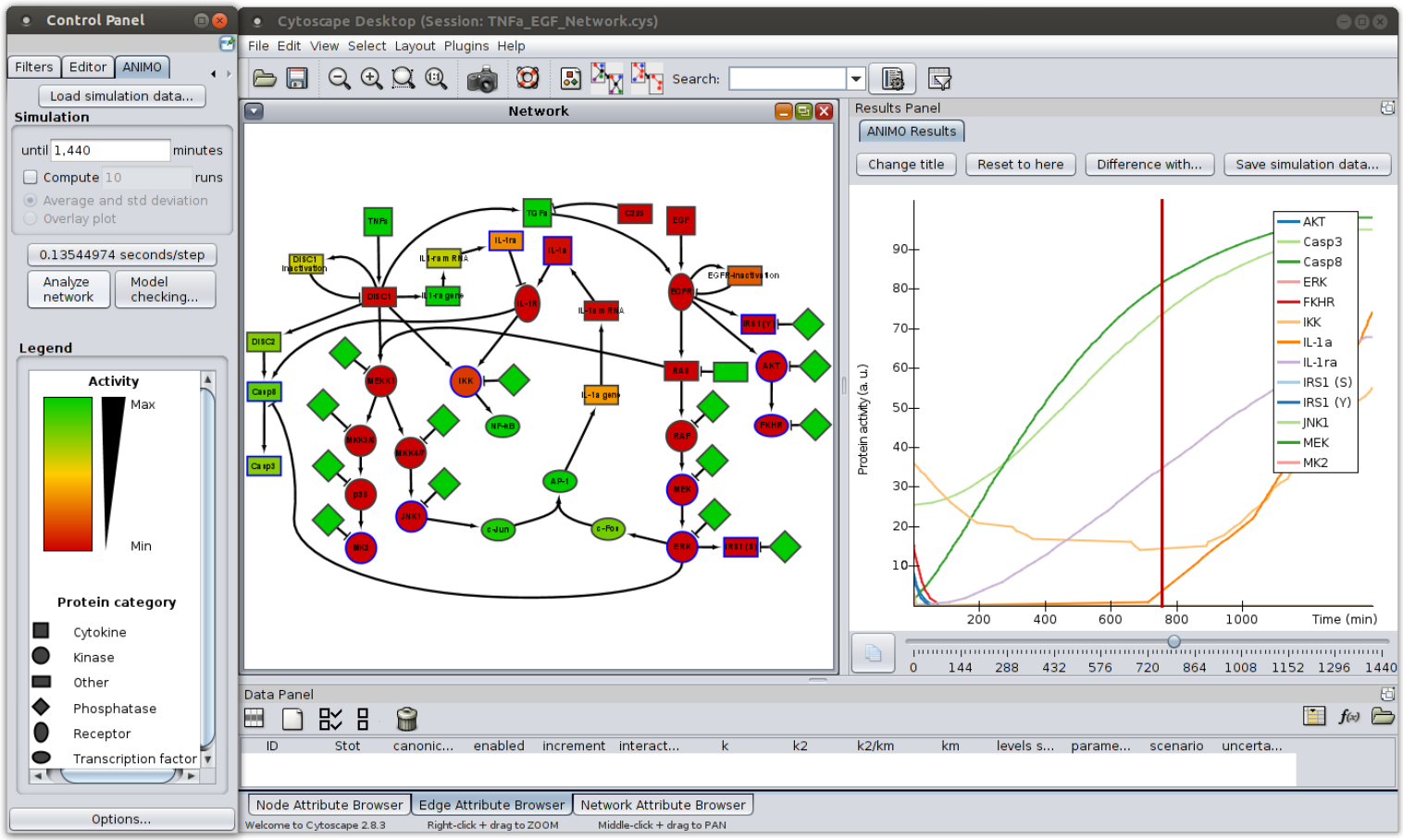
Credit: National Science Foundation

G-Protein Coupled Receptor Signaling to MAPK/ERK



Analysis of Networks with Interactive MOdelling

- Interaction based



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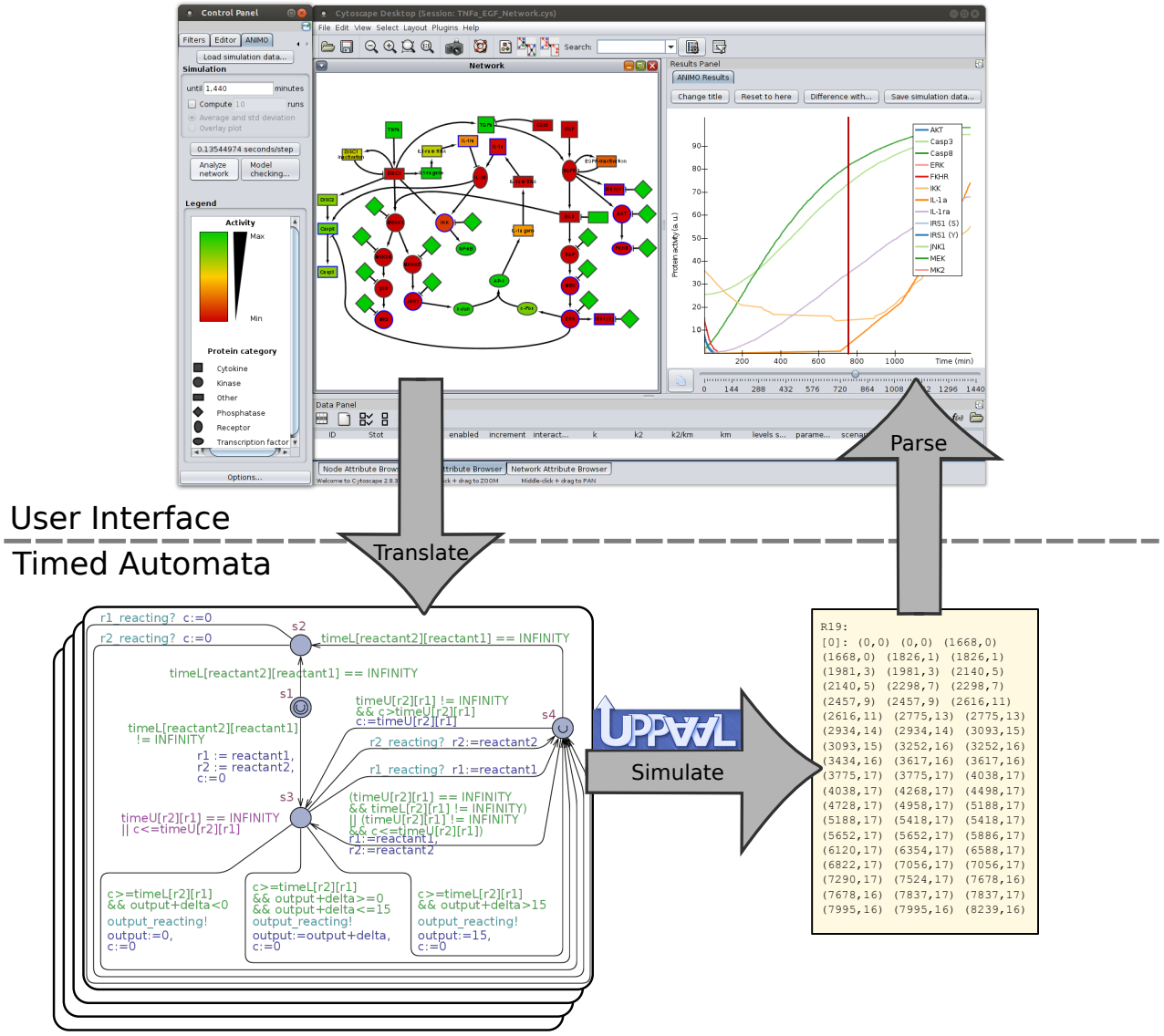
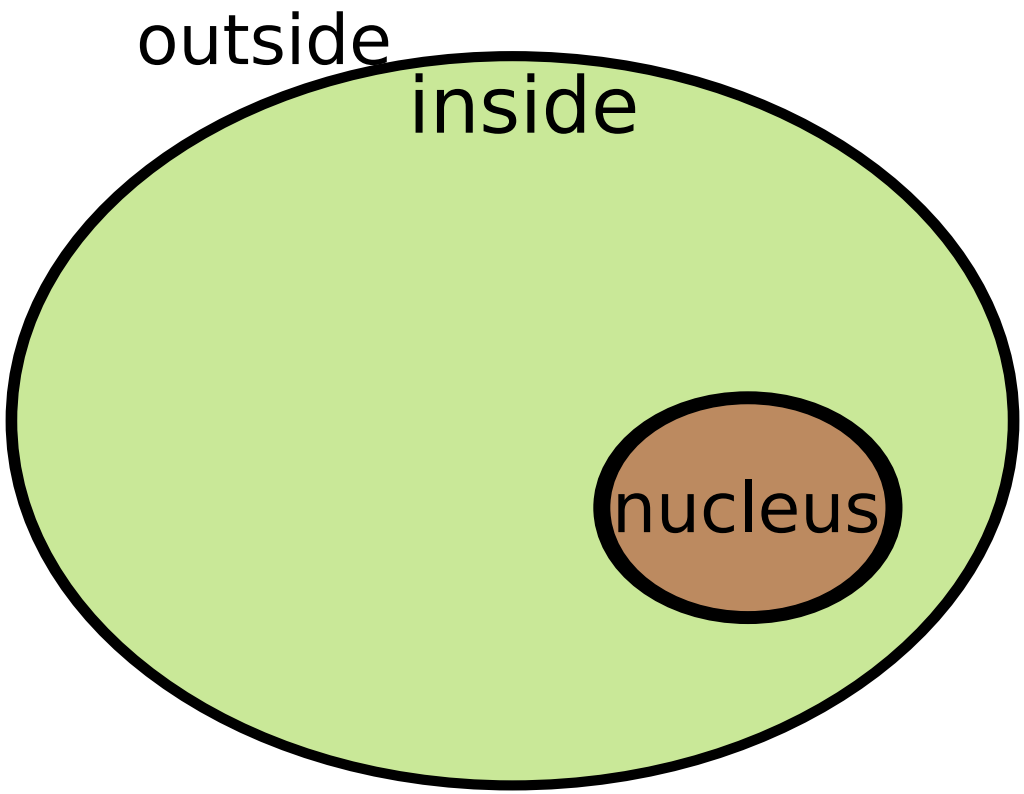


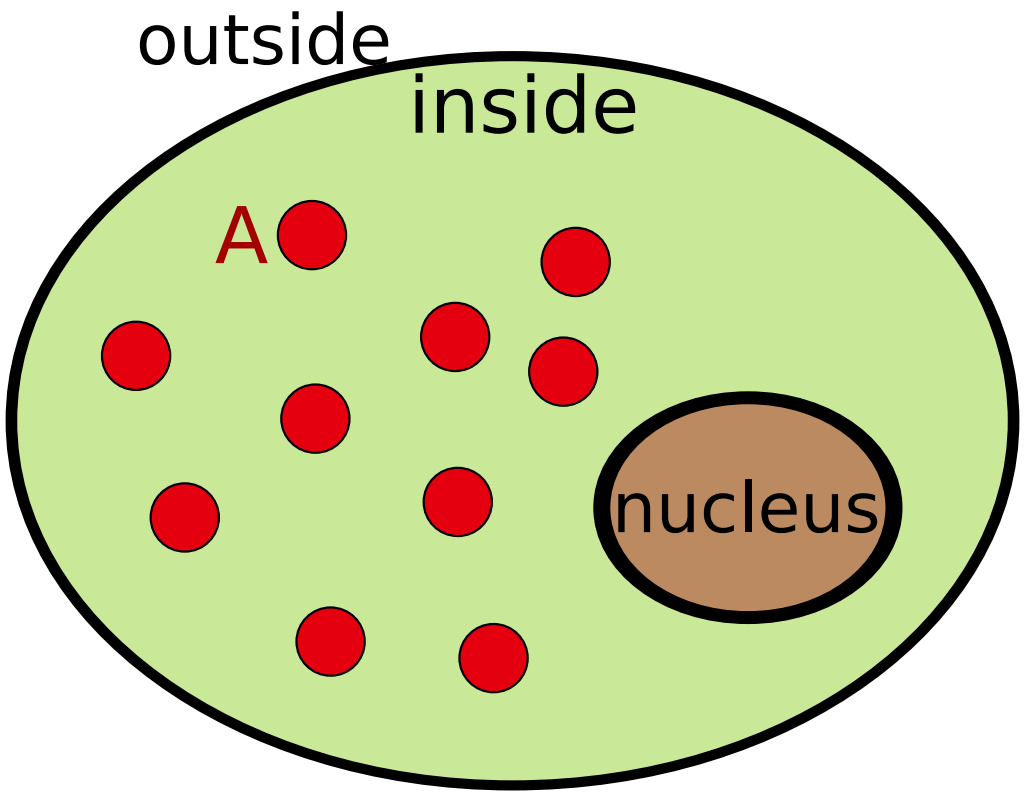
Analysis of Networks with Interactive MOdelling

- Interaction based
- Discrete concentration/activity levels

Discrete activity levels



Discrete activity levels



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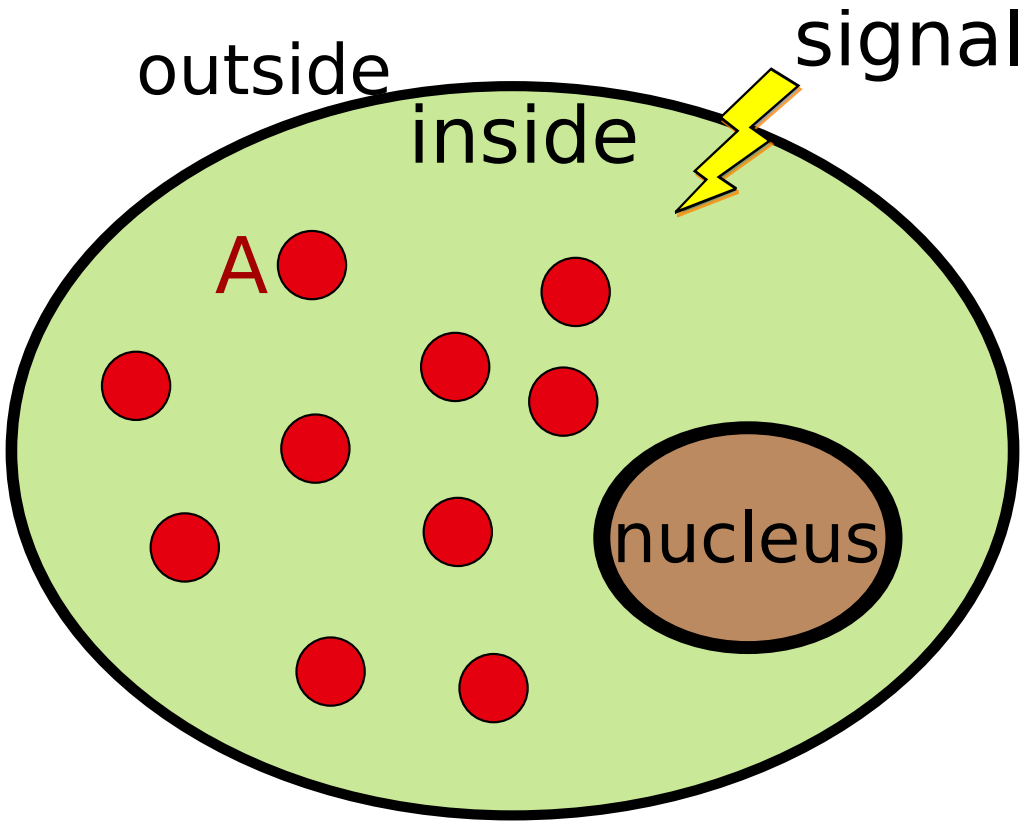

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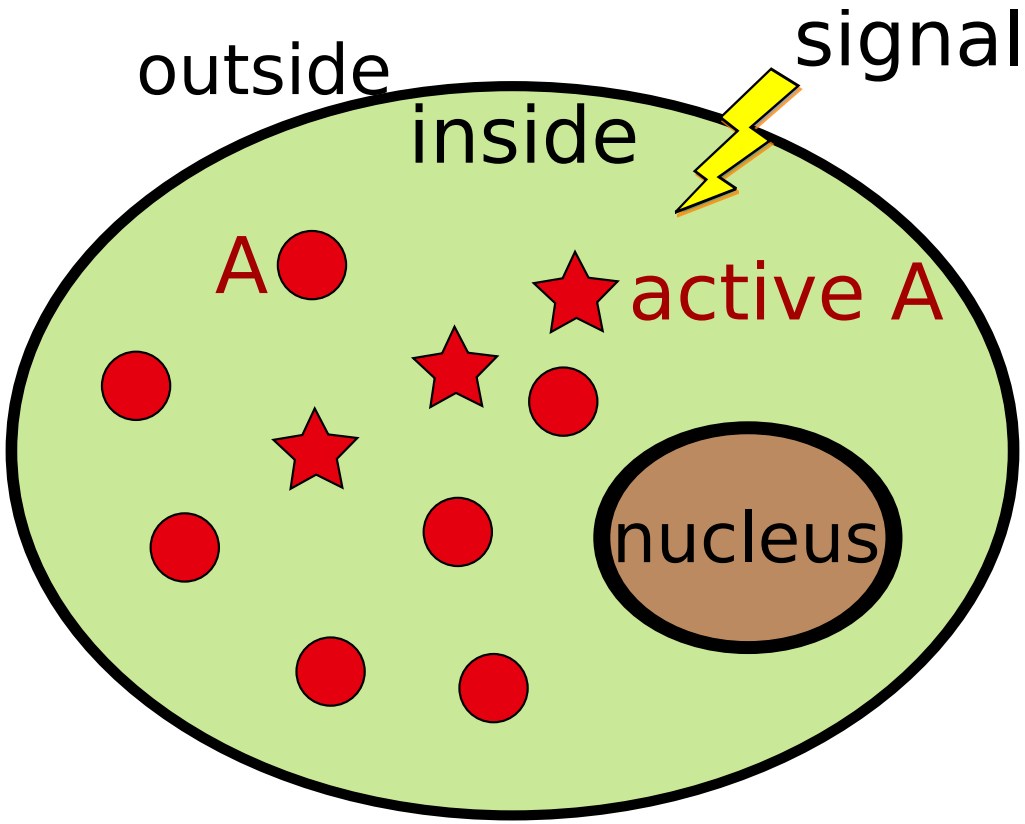

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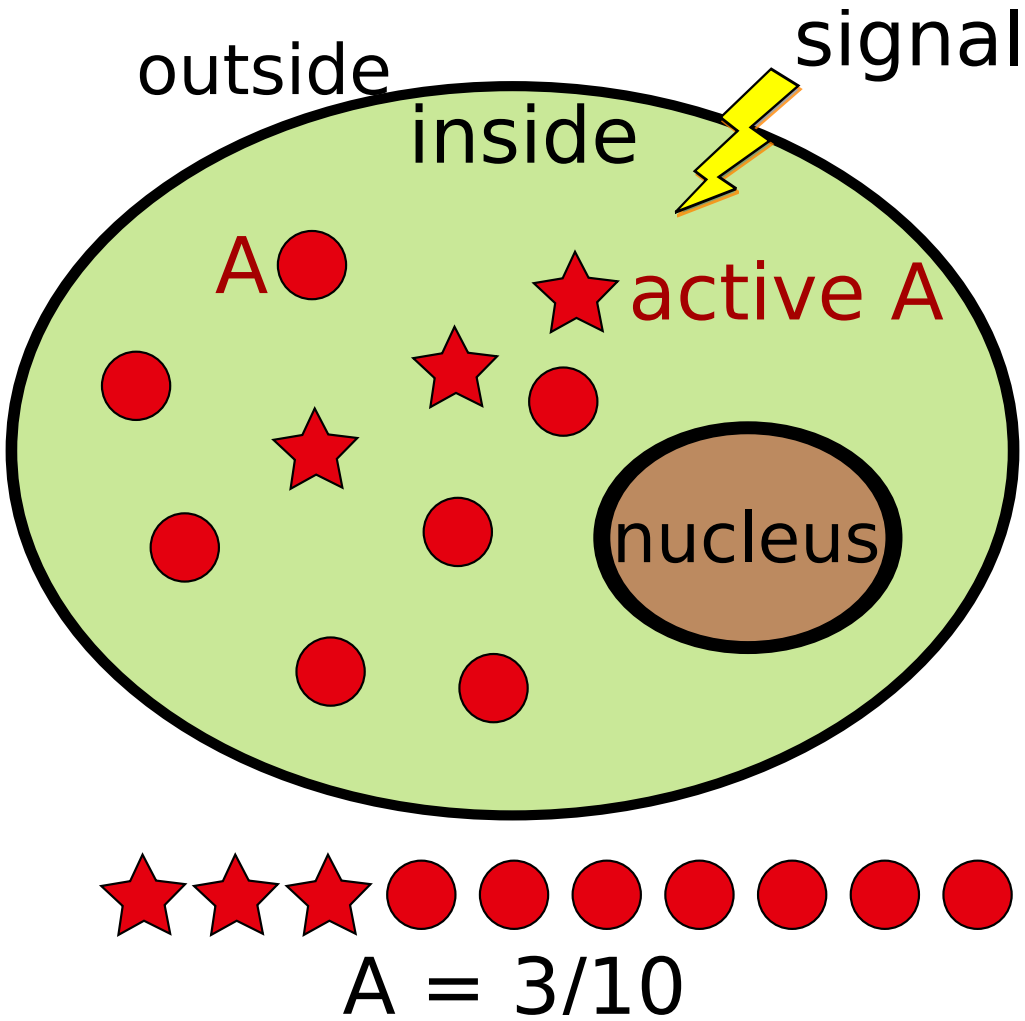

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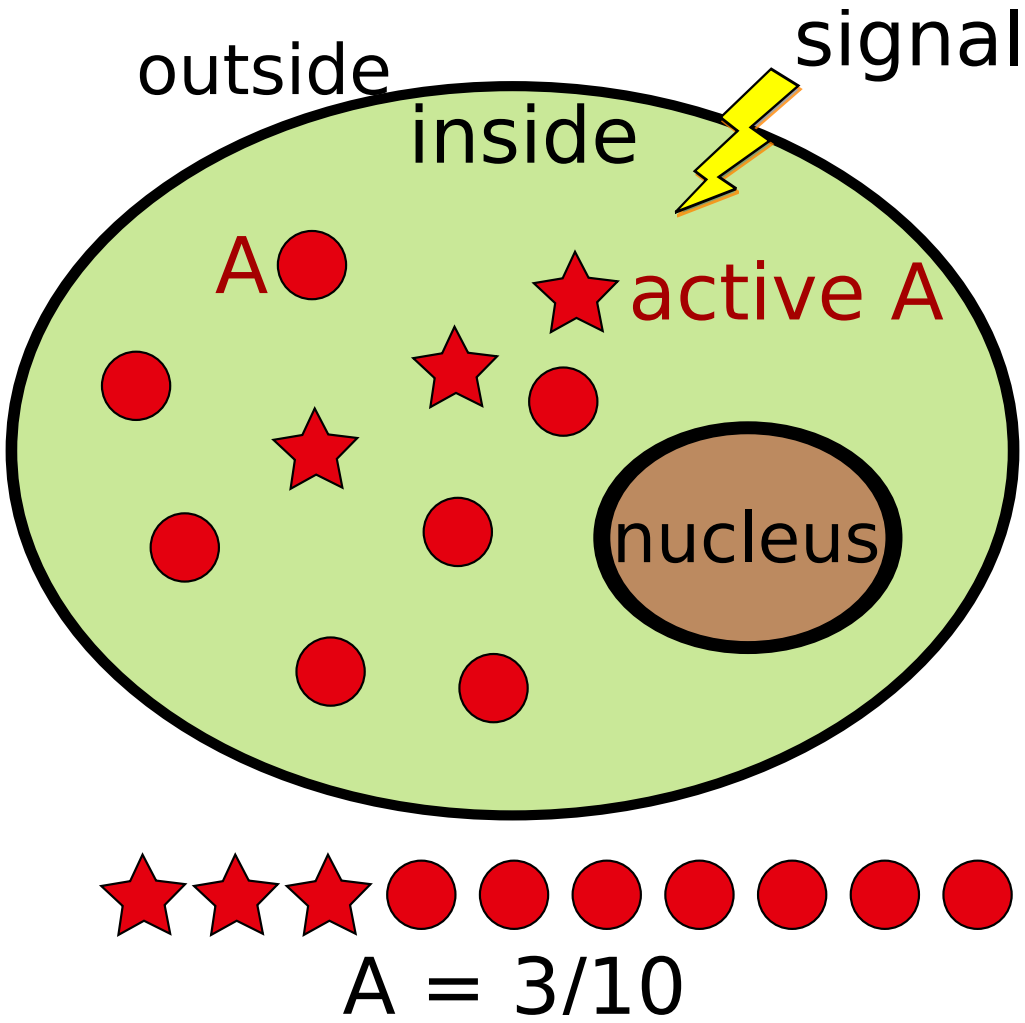

Let the user choose granularity: 2 - 100 discrete levels

Analysis of Networks with Interactive MOdelling

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- Precise reactions $\Rightarrow$ abstract *interactions*

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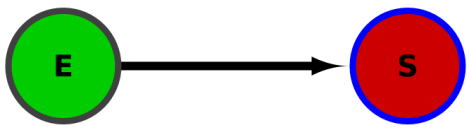
$\Downarrow$



Analysis of Networks with Interactive MOdelling

- Interaction based
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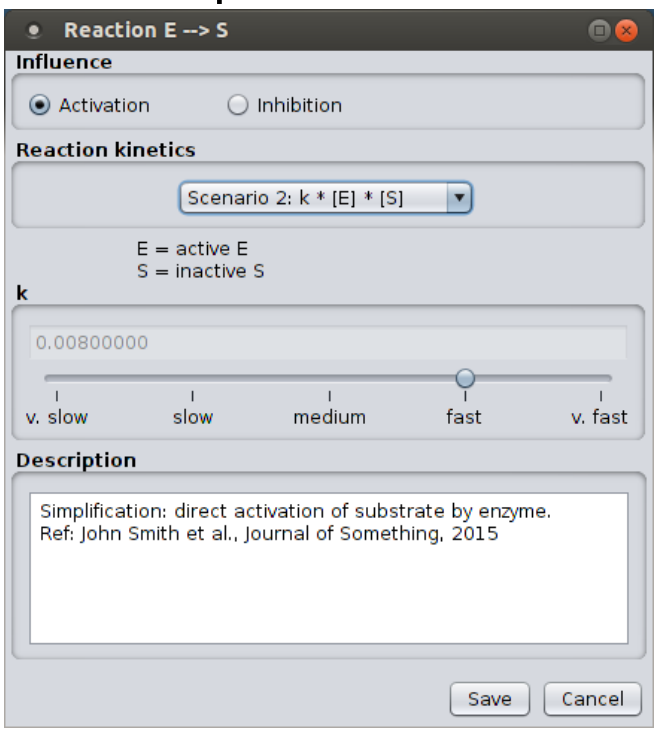
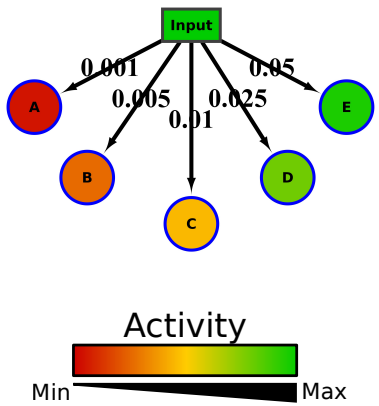
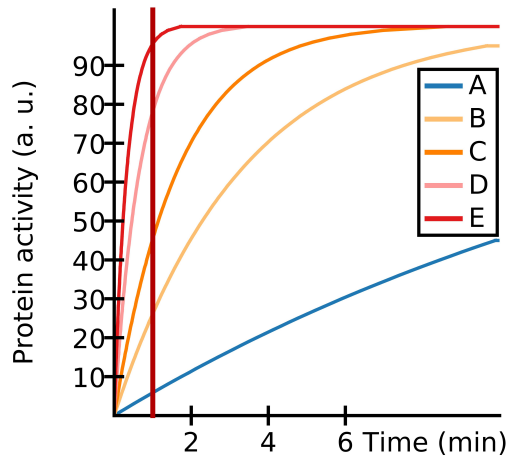
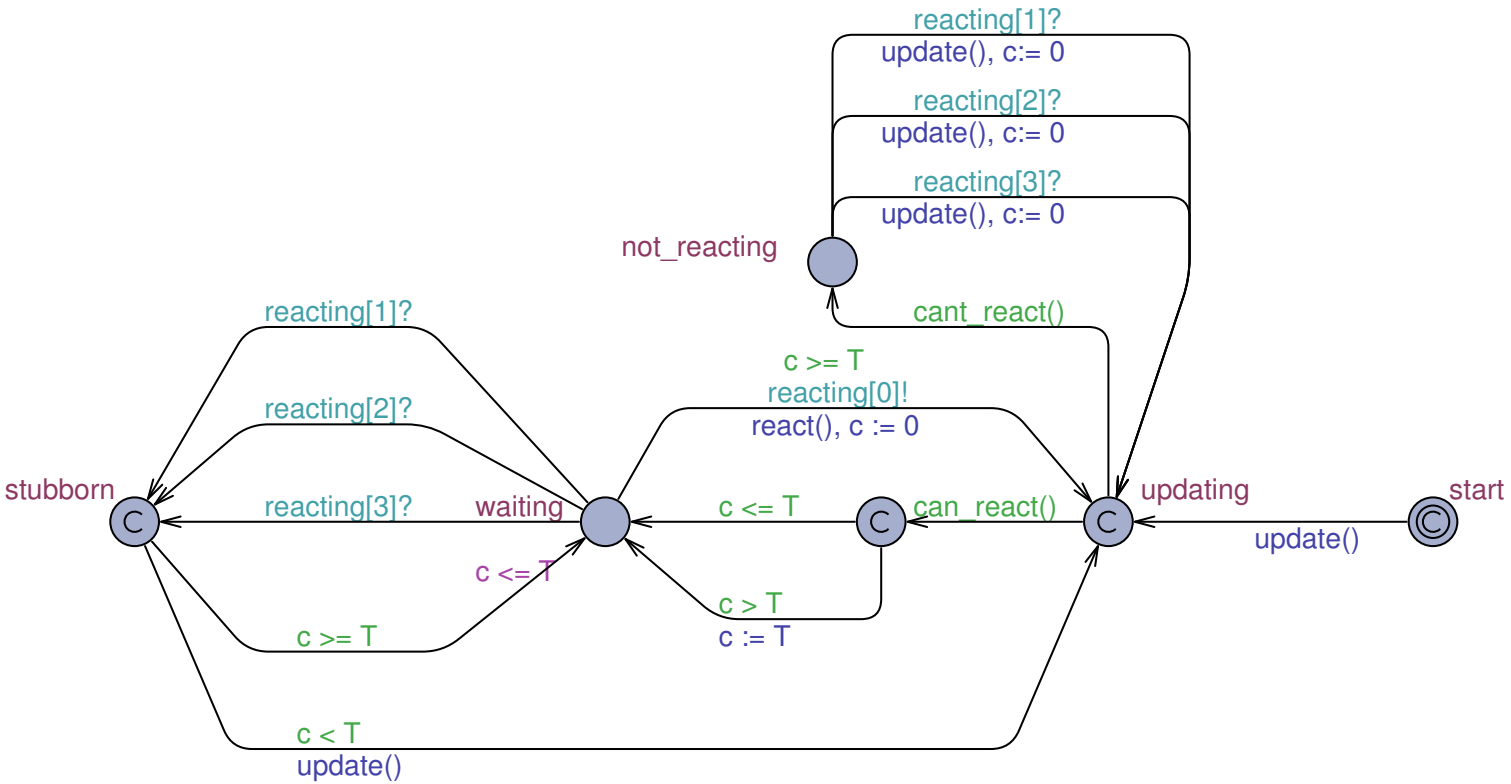
- Precise reactions $\Rightarrow$ abstract *interactions*
- Simplified scenarios for rate computation





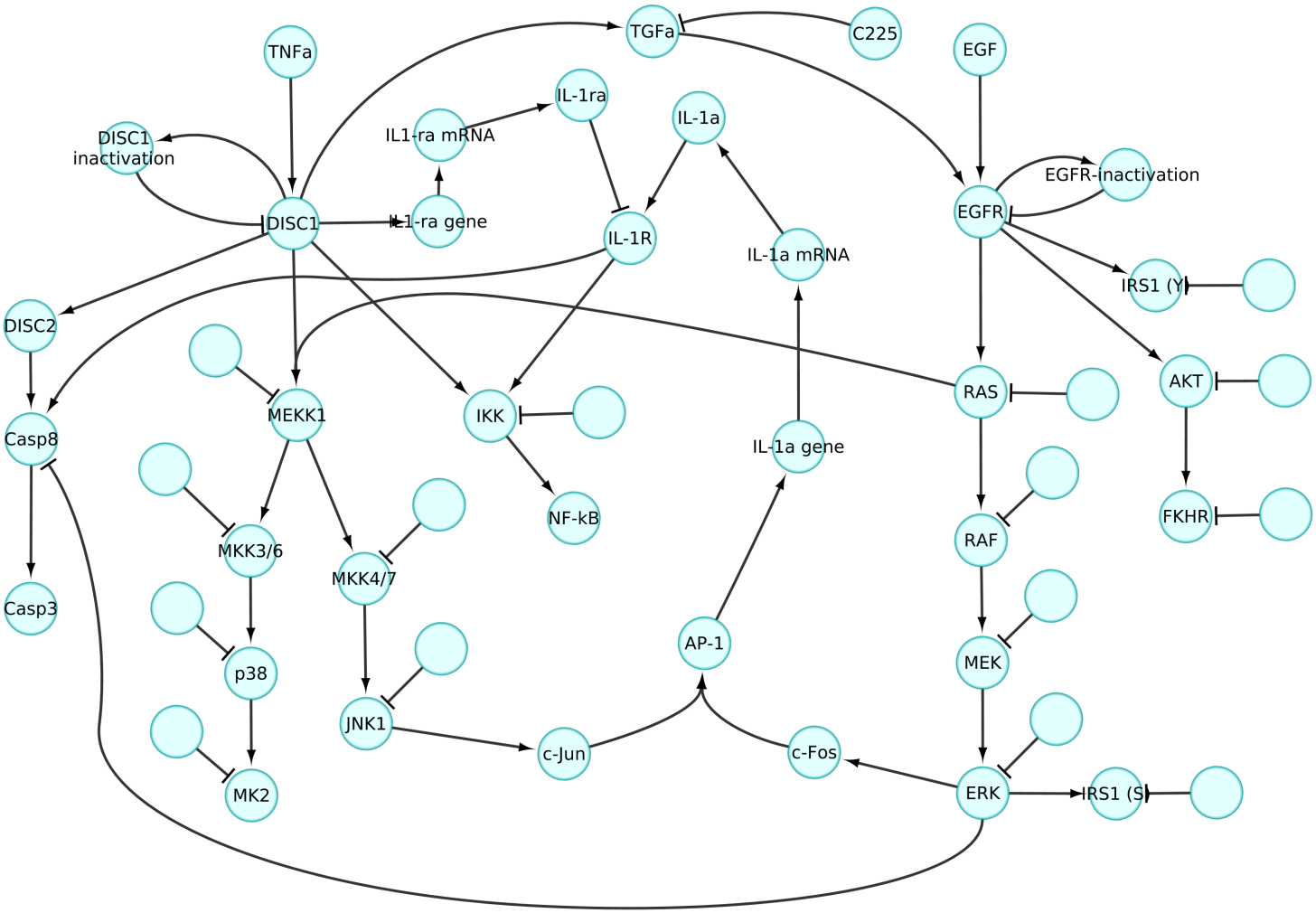


Timed Automata model



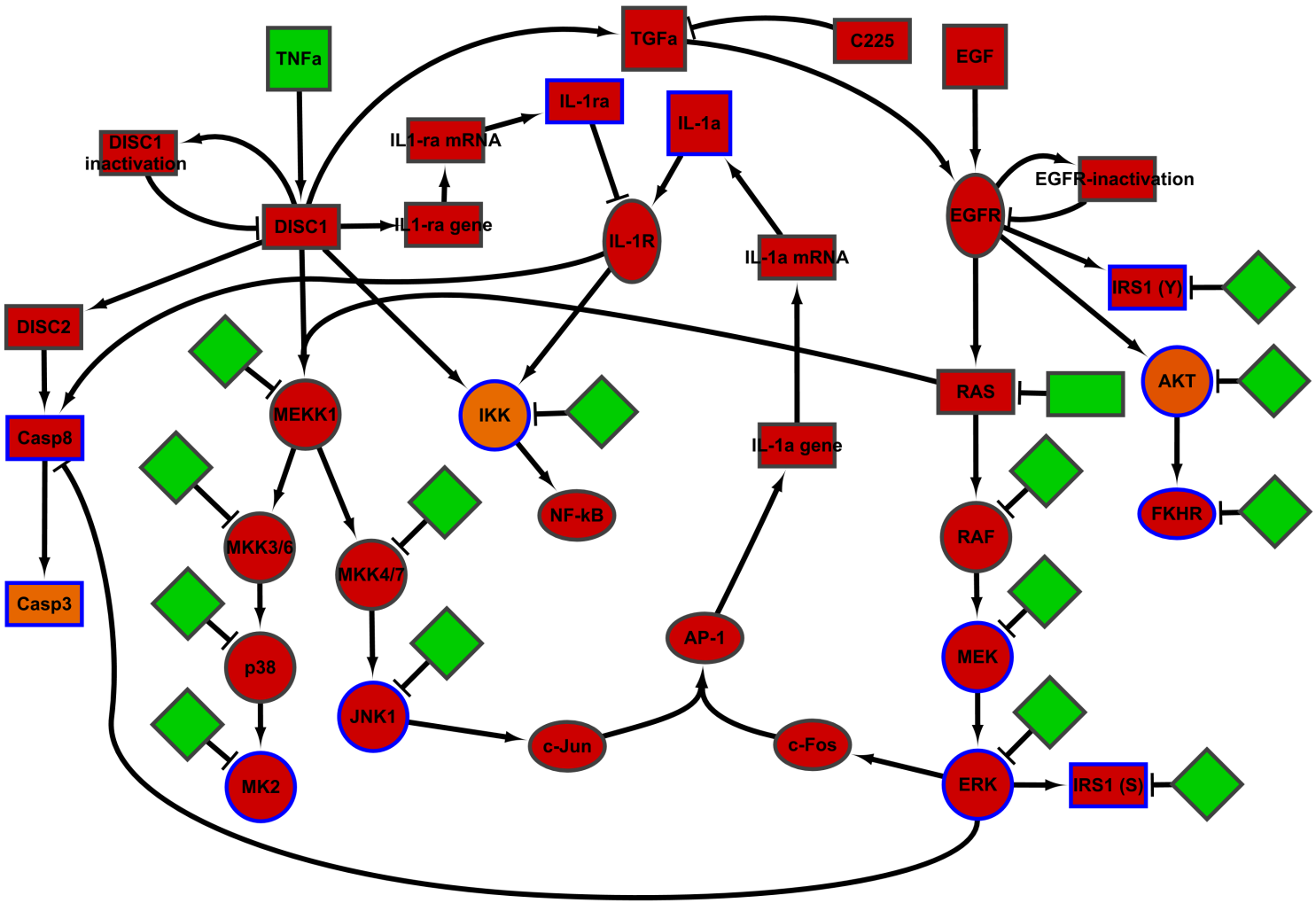
ANIMO workflow

Start from static network topology



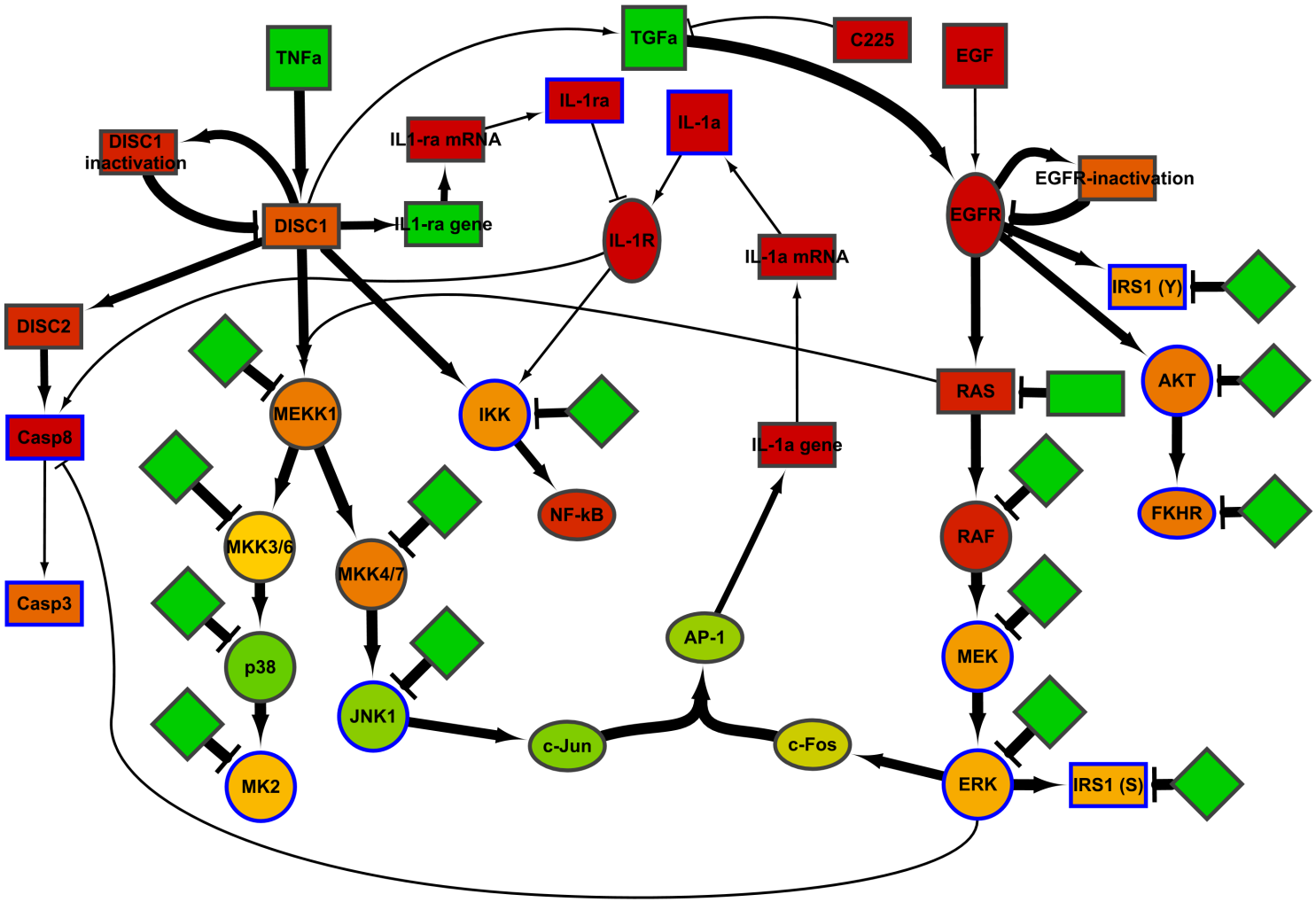
ANIMO workflow

Add kinetics and choose initial activities



ANIMO workflow

Inspect system evolution on the fly



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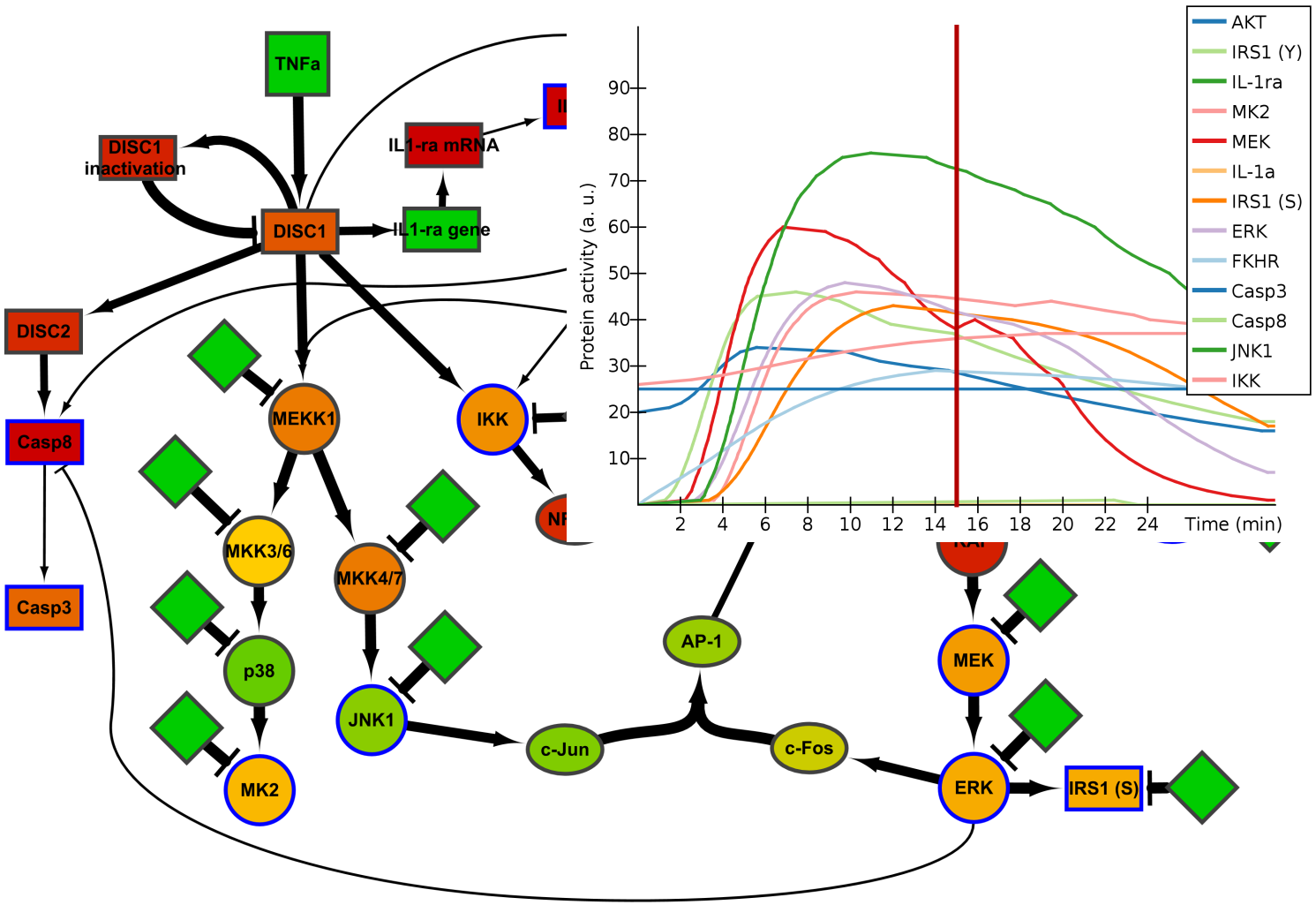

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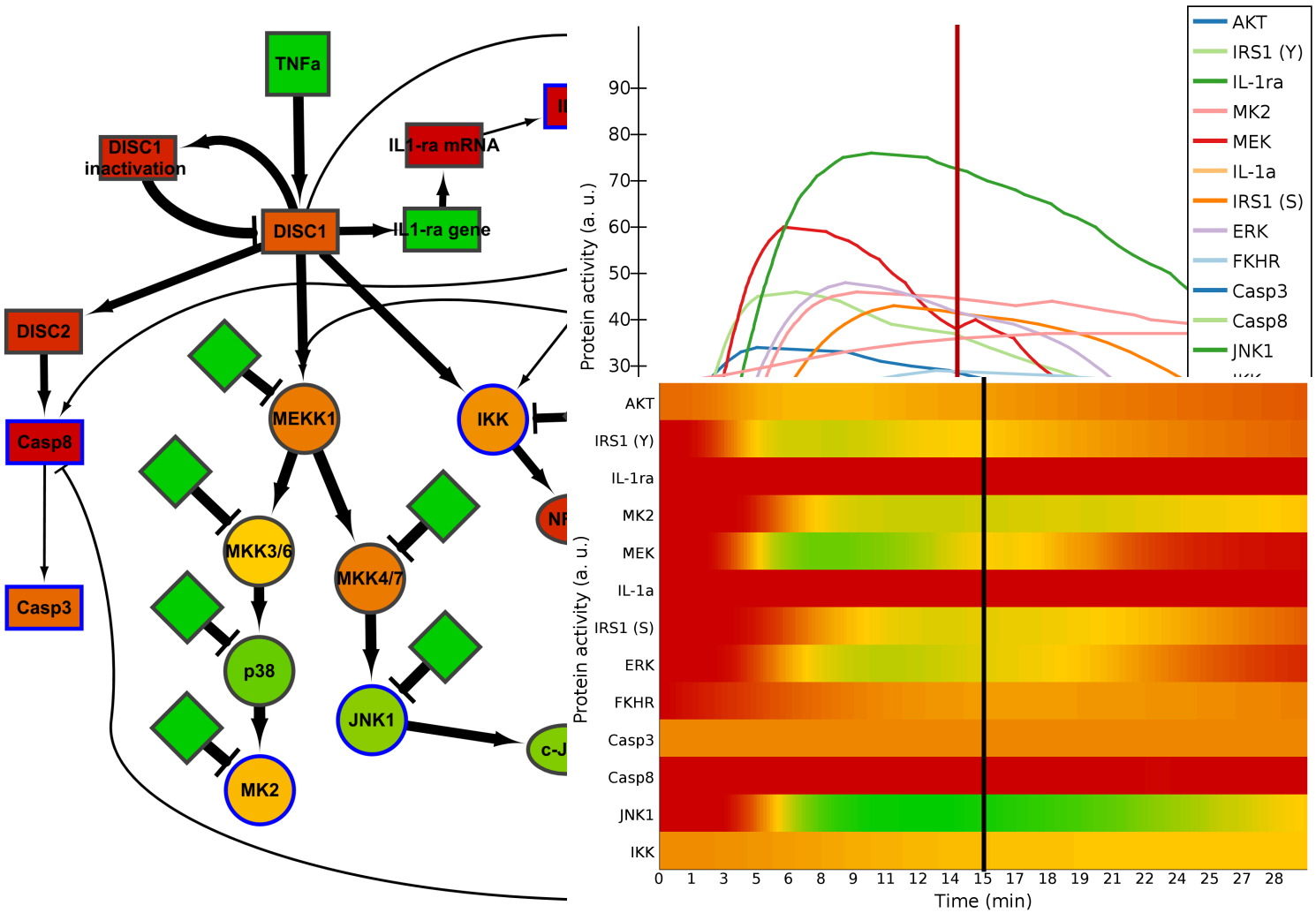
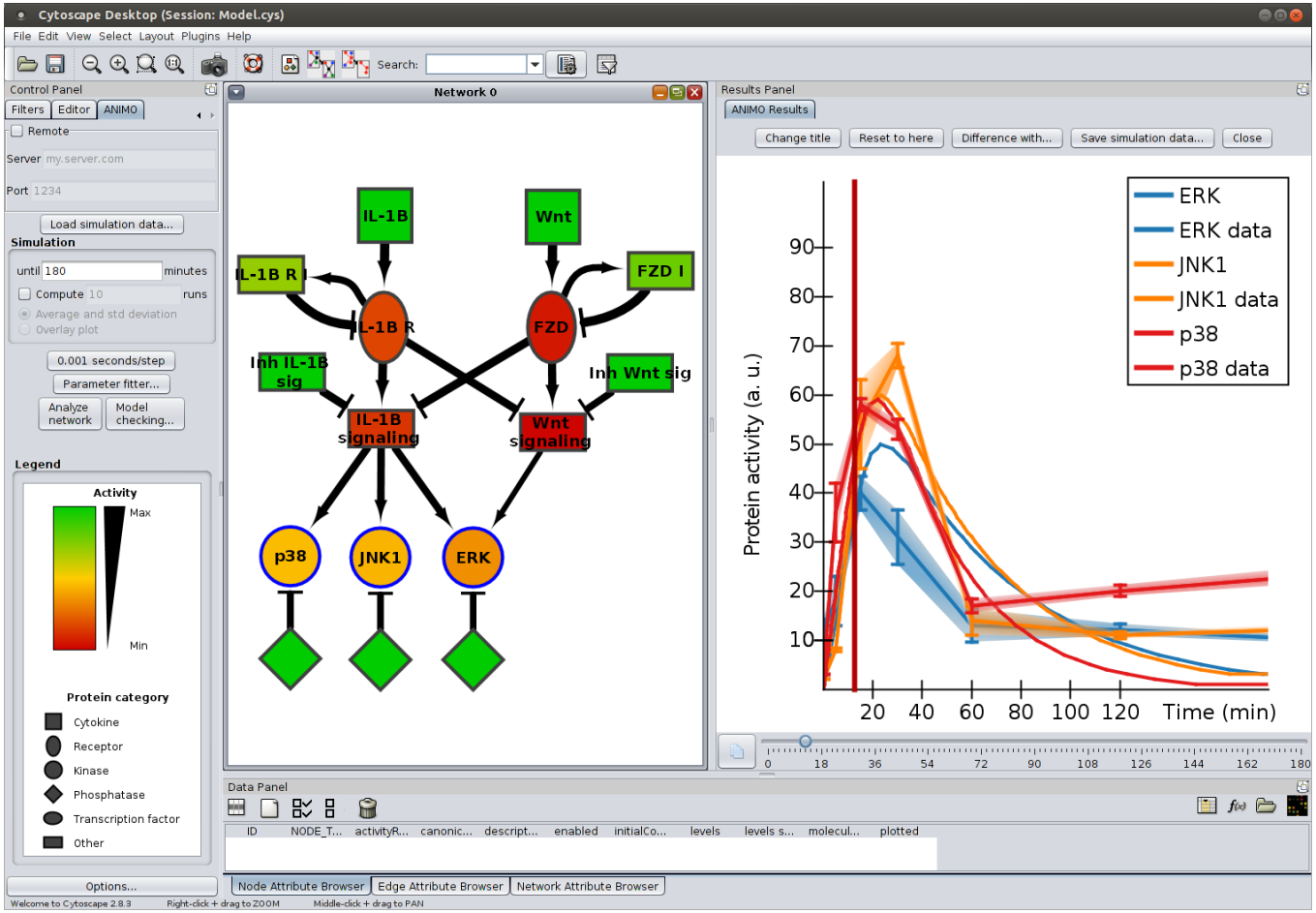


Experimental data as reference

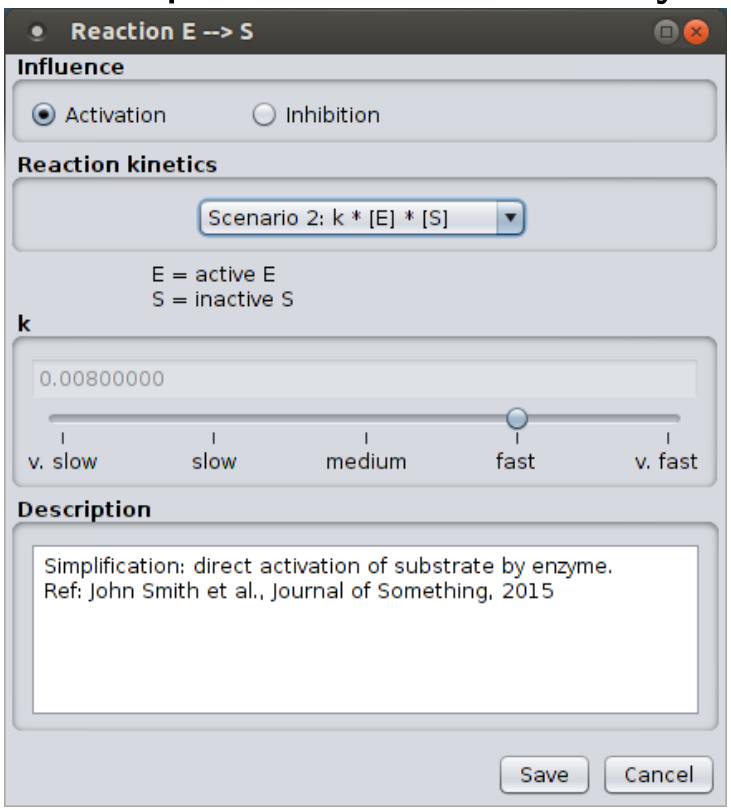


Use data and model to improve knowledge, generate hypotheses.

All good and nice, but...

How to find the parameters?

- Insert parameters manually



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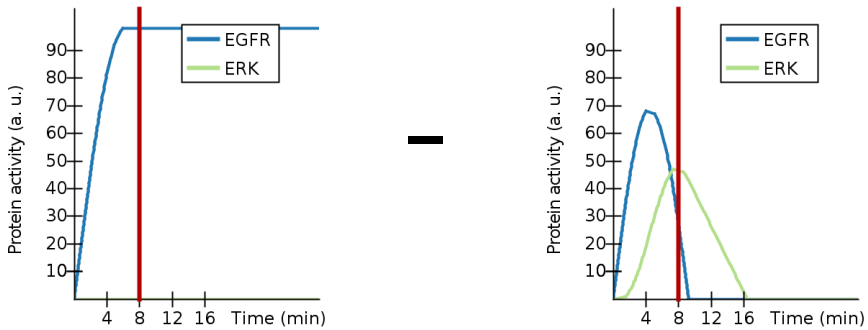

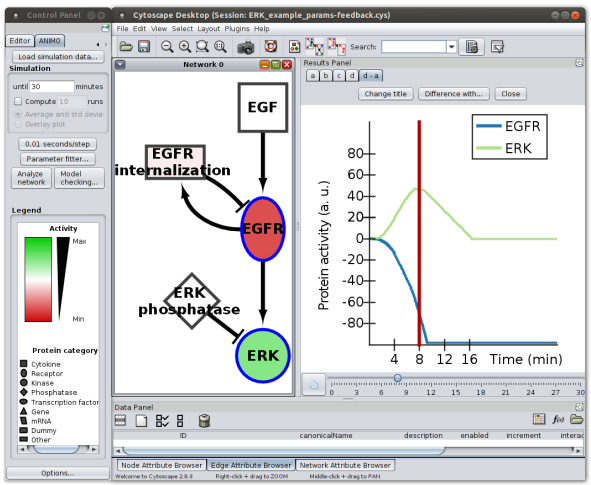

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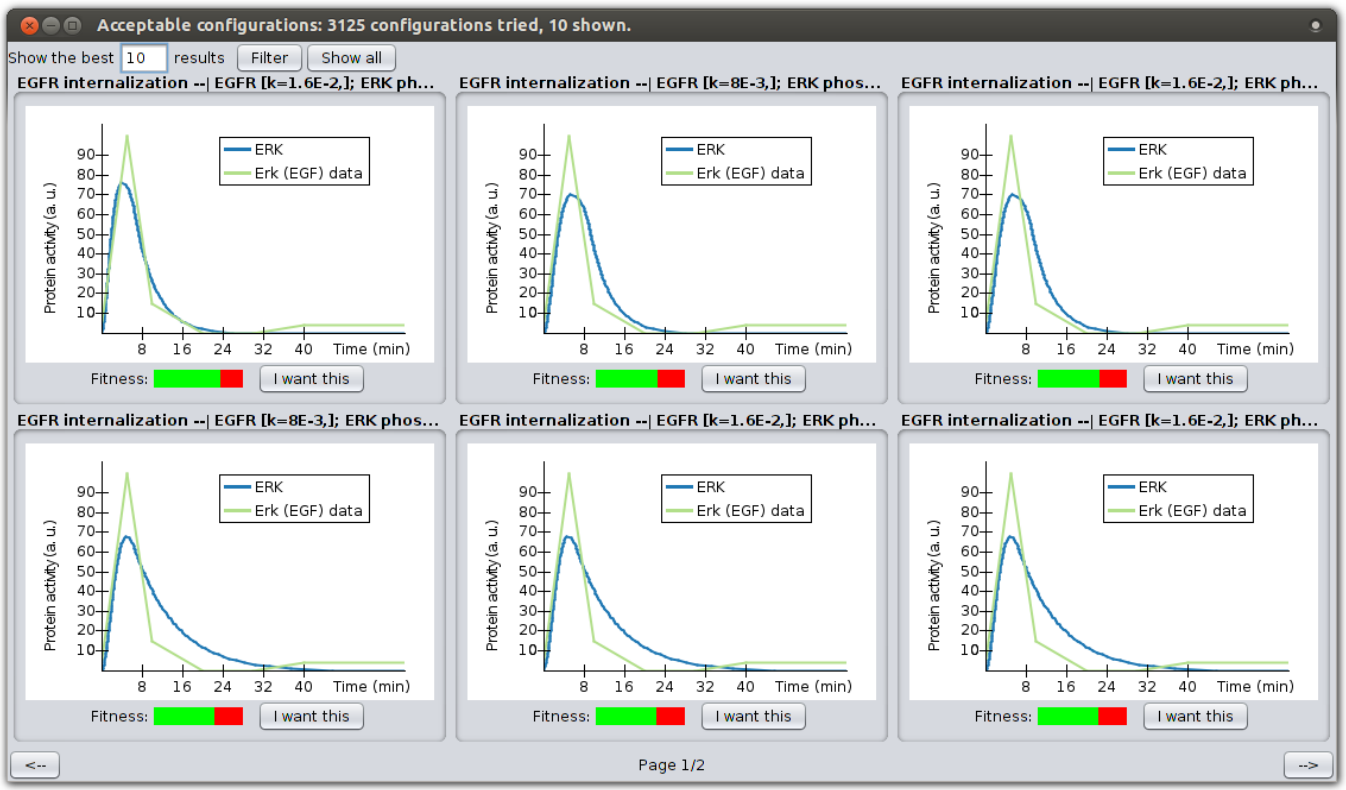
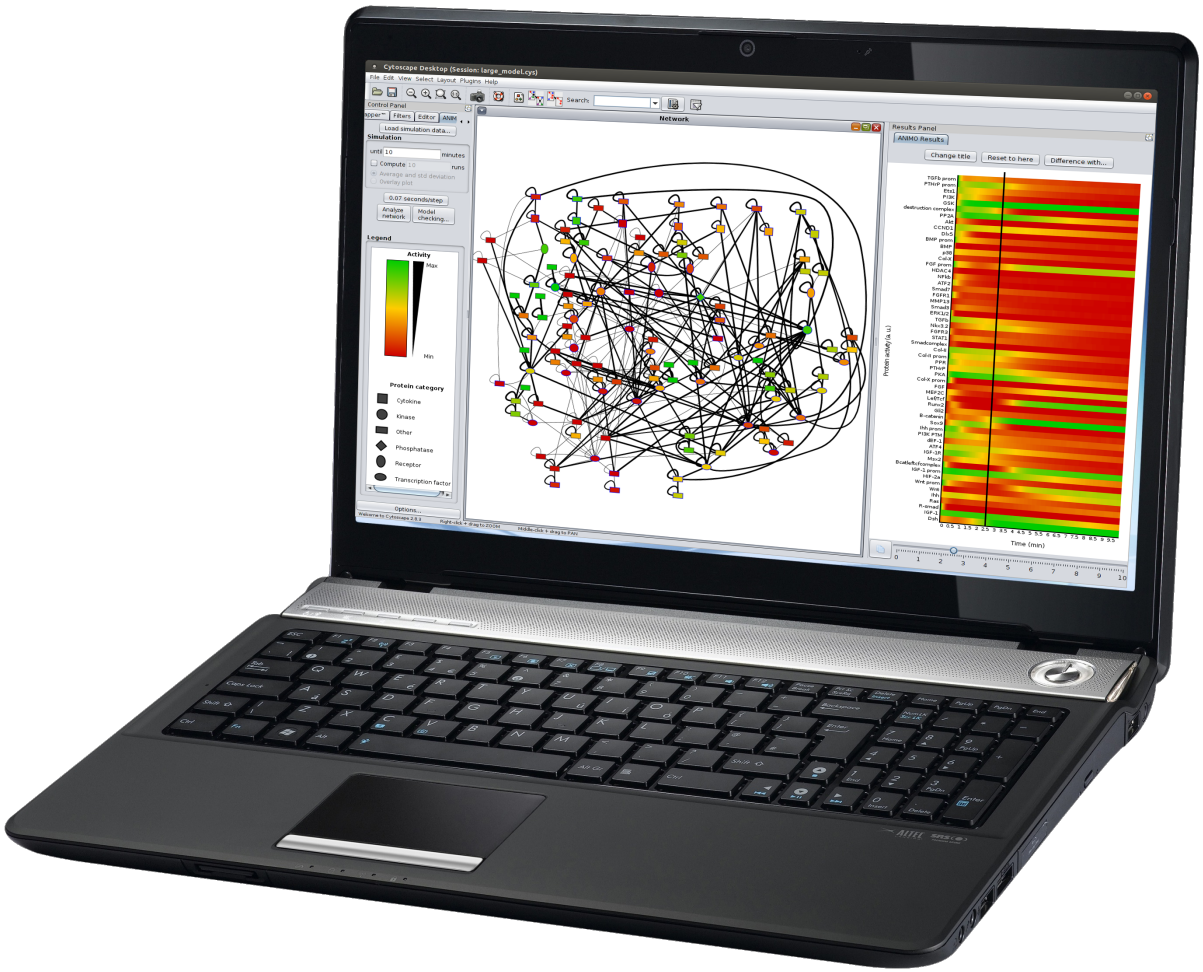


ANIMO live demo



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- ANIMO allows biologists to draw network "sketches"
- Parameter choice:
  - manual settings, choice of qualitative parameters
  - comparison of different model versions
  - parameter sweeps

Future work

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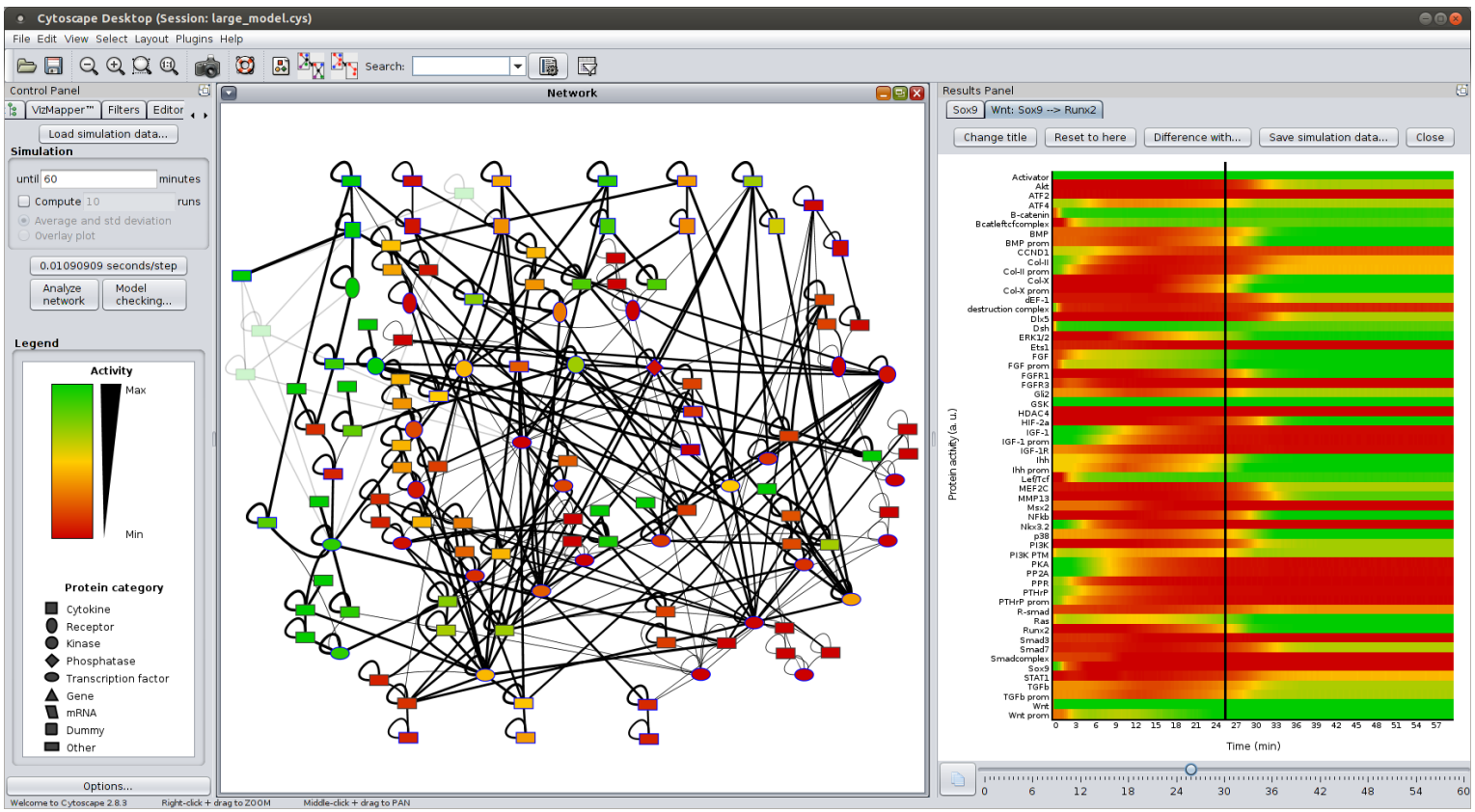

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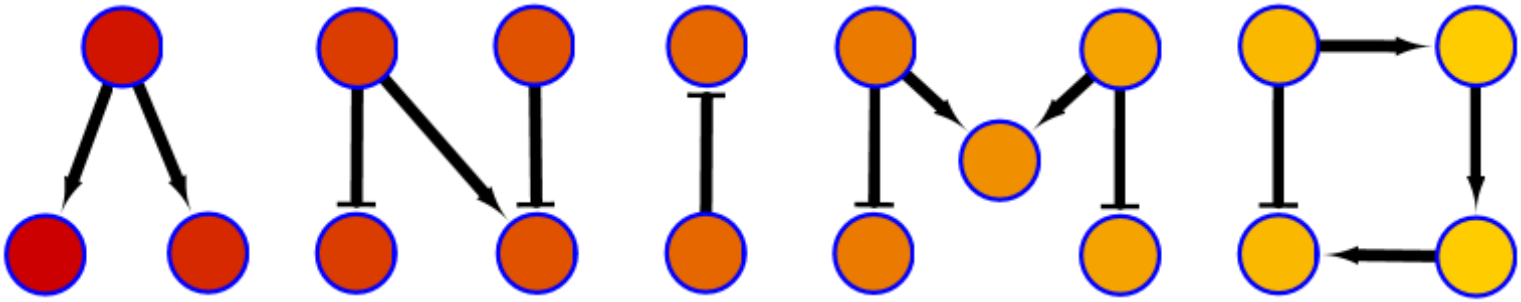
- Abstraction techniques to deal with large models

Thank you



Analysis of Networks with Interactive MOdelling

`http://fmt.cs.utwente.nl/tools/animo`