

# Towards a Model for Navigation Support in Learning Networks

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# Towards a Model for Navigation Support in Learning Networks

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# Outline

- Introduction: LLL and Learning Networks
- Recommender systems
- Initial model to simulate navigation support
- Initial experiment/results
- Conclusions
- Future work



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# Lifelong Learning

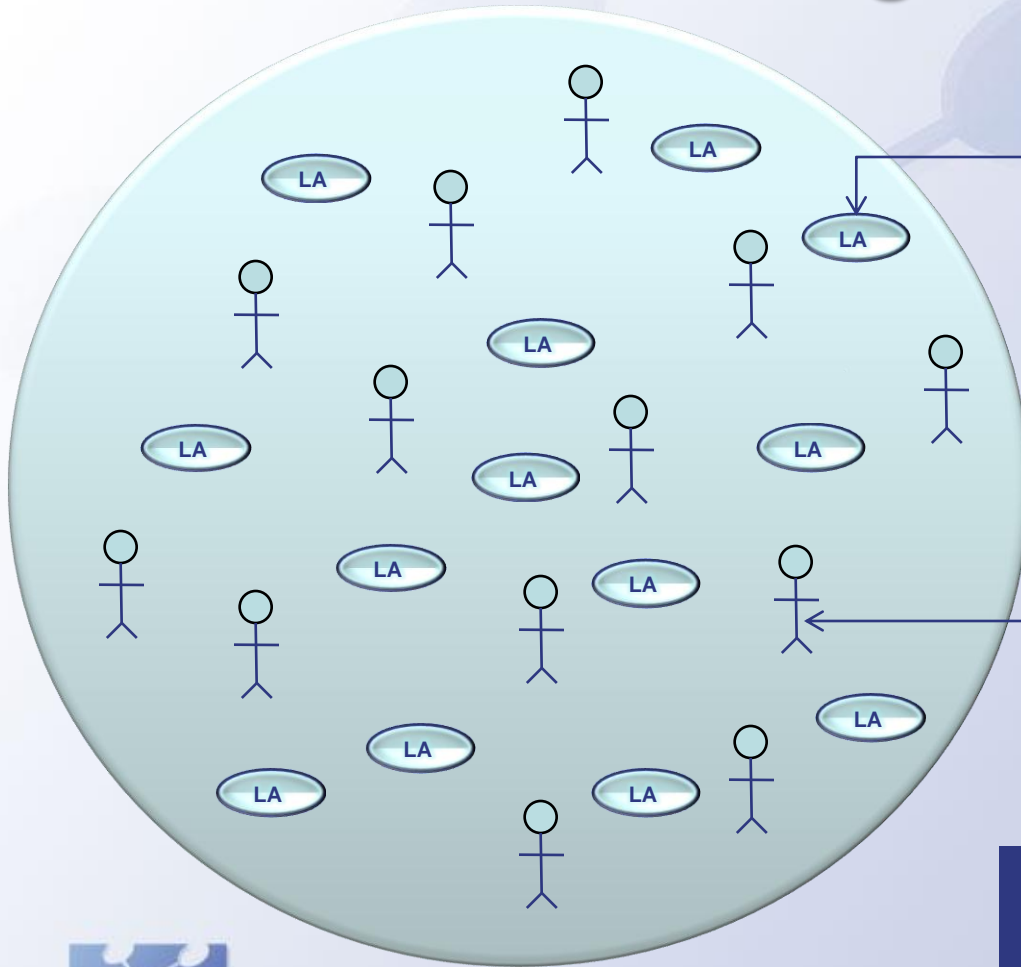
- Lifelong Learning:
  - Learning as an integral part of our life
  - Formal, non-formal and informal learning options
  - Essential to sustained economic growth
- Learners want/need to develop their competences
  - Different profiles (ePortfolio)
  - Different providers
- Learners need advice to choose the learning activities that best fit their needs
  - ***Navigation Support***



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# Learning Networks



## Learning actions

help students to acquire a competence:

- courses
- assessments
- learning resources
- workshops, etc...

## Participants

learners, institutions, trainers, teachers...

Self-organized online communities designed to facilitate LLL  
Participants acquire competences and share knowledge and resources



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# Recommender systems

- Help users to reduce information overload by delivering personalized items, content, services
- Memory-based techniques. Collect information users/items to calculate recommendations:
  - content-based techniques: based on the items the user liked before
  - collaborative filtering techniques: based on items that users who have the same profile liked
  - hybrid techniques: combination of the above



# Recommender systems

- Used for recommending
  - Books: [www.amazon.com](http://www.amazon.com)
  - Movies: [movielens.umn.edu](http://movielens.umn.edu)
  - Recommendation based on interests, rating, user's history
- LLL is different...
  - An interesting item might not be pedagogical relevant, nor in line with prior knowledge/skills



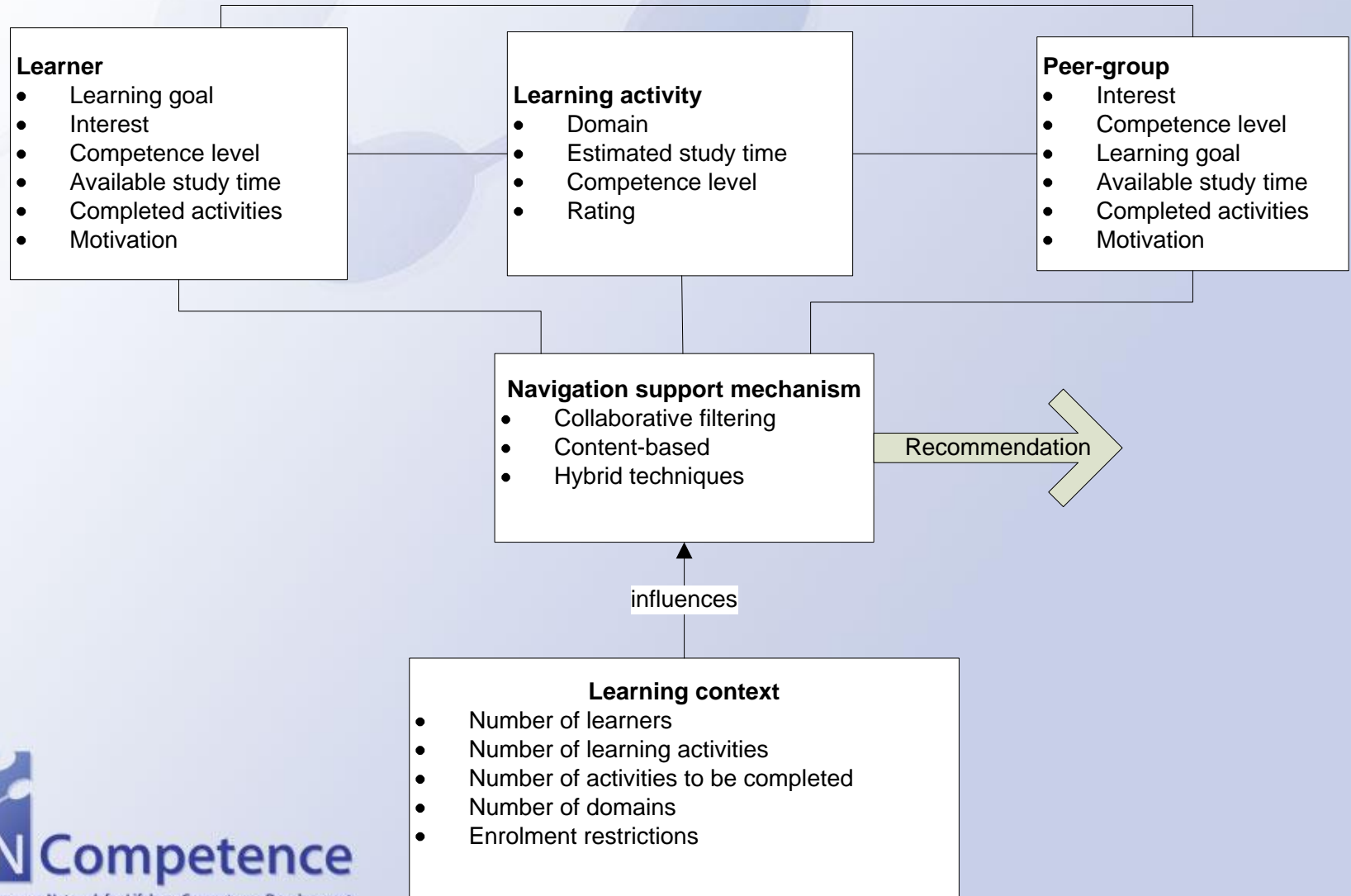


# Recommender systems

- In LLL, which characteristics should be taken into account?
  - Learner's profile (ePortfolio)
  - Characteristics and usage data of the learning activities
  - Peer behaviour
  - Learning context (number of learners, number of LA's)
- Which recommendation technique performs better (content-based, collaborative filtering, hybrid)?
  - (better = less dropout)
- Simulation, NetLogo



# Initial model



# Simulation

The screenshot displays the NetLogo environment for a simulation titled 'start4'. The interface includes a menu bar (File, Edit, Tools, Zoom, Tabs, Help), a toolbar with various tools like 'Button', 'Slider', and 'Monitor', and a main workspace showing a network of agents (represented by small colored squares) connected by pink lines. The agents are distributed across the workspace, with a dense cluster in the center.

On the left side, there are several control panels:

- Filtering Strategy:** A panel with a 'content-based' switch set to 'Off'.
- Collaborative:** A panel with three switches: 'interest?' (Off), 'study-time?' (Off), and 'competence?' (Off).
- Parameters:** A panel with several sliders and monitors: 'domains' (set to 2), 'nb-LAs' (250), 'nb-LAs-to...' (20), 'nb-LNUs' (1000), 'match-f...' (1), and 'obedience-control-group' (1).

On the right side, there are several data monitors and two line graphs:

study time c1	study time c2	learners
34	0	1000

success c1	success c2	weeks
865	0	52

drop-out c1	drop-out c2
135	0

The top graph, titled 'drop-out', shows the number of drop-outs over time. The y-axis is labeled 'n drop-out' and ranges from 0 to 147. The x-axis is labeled 'weeks' and ranges from 0 to 58.2. The curve shows a rapid increase in drop-outs, reaching a plateau of approximately 147 around week 58.2.

The bottom graph, titled 'graduates', shows the number of graduates over time. The y-axis is labeled 'n graduate' and ranges from 0 to 900. The x-axis is labeled 'weeks' and ranges from 0 to 58.2. The curve shows a rapid increase in graduates, reaching a plateau of approximately 900 around week 58.2.

At the bottom, there is a 'Command Center' with a text input field containing 'observer >' and a 'Clear' button.



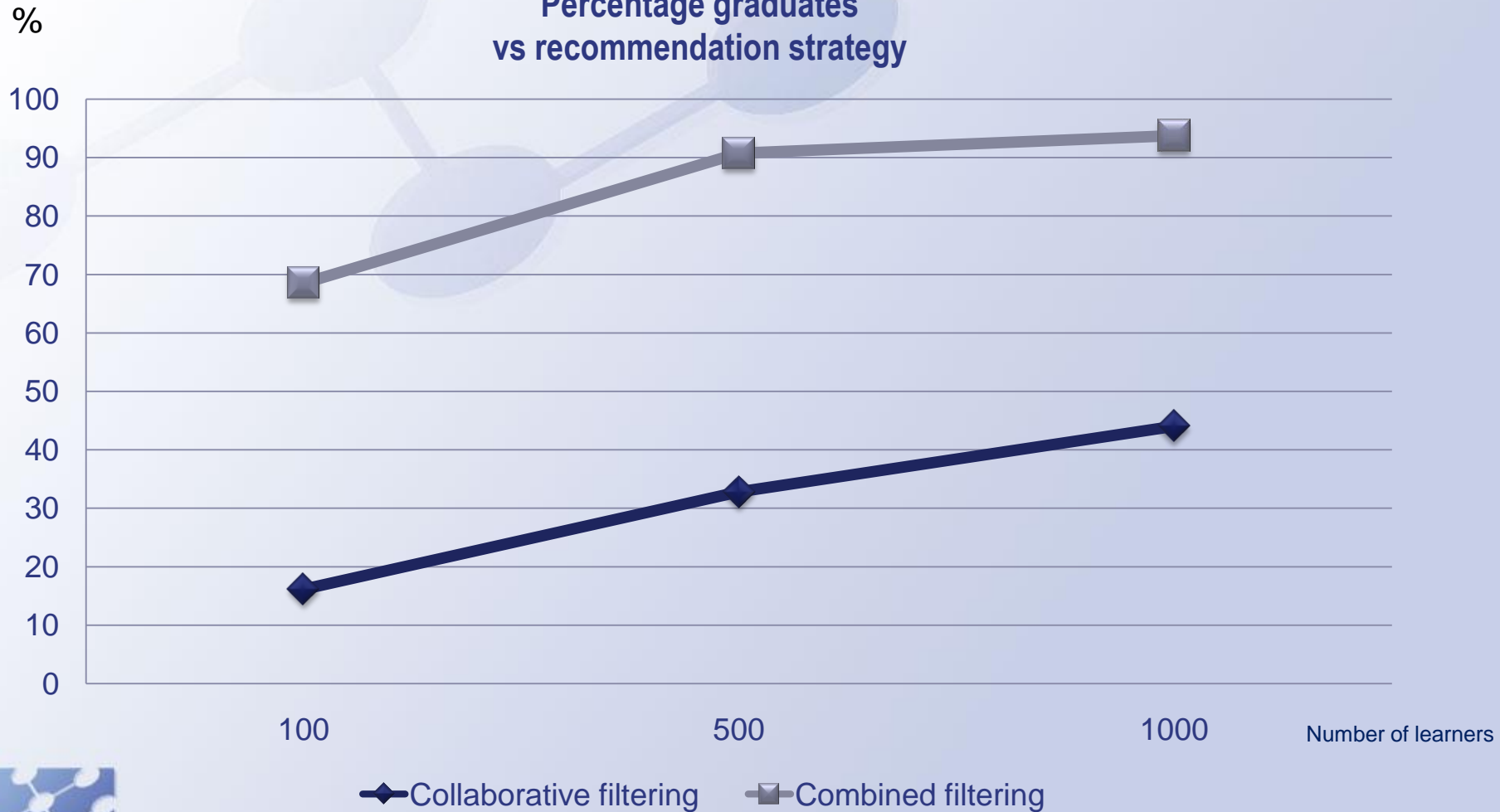
# Initial experiment

- Aim: exploring if navigation support mechanisms have an influence on the number of graduates
- Two series of 64 simulation runs
  - Series 1: collaborative filtering
  - Series 2: combination of content-based & collaborative filtering techniques
  - Number of students: 100, 500, 1000
  - Collaborative filter technique: interest, study time, competence level
  - Domains: 7
  - Learning activities: 250
  - Number of learning activities to be completed: 20
  - Match factor: 1 (the recommendation should match 100%)
  - Obedience: 1 (the student follows all the recommendations)



# Initial results

Percentage graduates  
vs recommendation strategy



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# Conclusions

- The percentage of graduates is higher if a hybrid mechanism is used
  - In a simulation with 1000 learners more than the 90% of the learners graduated
  - The number of learners does not have an impact
  - Content-based techniques help to overcome the “cold start problem”
  - Start with content-based and, when enough information is available, use a collaborative filtering technique



# Conclusions

- ePortfolio
  - Contains valuable information that can be used to develop advanced recommendation services
  - Simulations can help to decide which information is relevant to include



# Future work

- Include
  - Preference gap (match LA towards learner's preferences)
    - → influences effort AND learner's success
  - Competence gap (align LA towards learner's competence level: zone of proximal development)
    - → influences effort AND learner's success
  - Competence levels
  - Constraints-circumstances
  - Rating
  - Efficiency-measures (more in less time)



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