INVESTMENTS IN EDUCATION DEVELOPMENT

# Scientific stay
## University of Wollongong, Australia

Jan Outrata

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# Place

- University of Wollongong, Australia – 1951/1975, state "Centre of Excellence", over 26 000 students, 9 faculties, 3 campuses, 8+1 research centers
- Centre for Digital Ecosystems, School of Information Systems & Technology, Faculty of Engineering and Information Sciences



Figure: Entrance to campus (on the left), building of the school (in the middle) and entrance to the centre (on the right).

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- Centre for Digital Ecosystems, School of Information Systems & Technology, Faculty of Engineering and Information Sciences
- research areas: systems of "interaction and engagement support in collaborative environment" – combination of methods of natural language processing and data mining, particularly FCA, applications of FCA in the area of information systems (catalogization, searching and navigation)
- $\rightarrow$ CollectionWeb – data catalogization and navigation in digital multimedia libraries and collections
- $\rightarrow$ Virtual Museum of the Pacific – new concept of catalogization and navigation
- $\rightarrow$ SearchSleuth – extension of internet search engine with FCA-based navigation
- in the centre 1 professor and 4 PhD students, in the school 30 staff people and 50 PhD students
- research is funded mostly at university level from the state (New South Wales) and partially also from industry

# prof. Peter Eklund



$+$ PhD students Tim Wray and Peter Goodall

- research: development of FCA itself (representation and visualization of concept lattices, similarity of formal concepts, ontologies), application and utilization of FCA in the areas of information systems and web (information retrieval with usage of FCA, navigation in concept lattices, social tagging)

- projects are funded also from regional sources

- collaborators at several places in Australia (University of Queensland, R. Cole) and elsewhere in the world, f.i. TU Darmstadt (R. Wille), SAP Research Dresden (F. Dau), KU Leuven (J. Poelmans), LORIA Nancy Francie, a now also Palacky University in Olomouc (J. Outrata)

# Stay run (1)

- discussion of their current research, development of and navigation in digital multimedia collection of museum data with utilization of FCA – used PCbO algorithm for computing the set of formal concepts (concept lattice)

$\rightarrow$ developed and implemented an algorithm improvement: update of the set of formal concepts when incremental modification of input data (introduction, change of attributes and removal of objects), does not require the set of concepts present in data before the modification

$\rightarrow$ joint publication: performance evaluation of the algorithm on large real (museum) data – submitted to conference CLA 2013

- discussed the integration of the algorithm into the CollectionWeb system, negotiated an algorithm transformation into a distributed algorithm

# Stay run (2)

$\rightarrow$ developed an extension of our algorithms at Dept. Computer Science, Palacky University based on CbO algorithm by computation of order relation in concept lattice, i.e. into a concept lattice building algorithm, and merging with the previous improvement into a concept lattice update algorithm (without the need of concept lattice of data before the modification)

- discussion of master thesis of student Lukáš Havrlant from Dept. Computer Science, Palacky University under my supervision on the topic of extension of (internet) search engine with FCA-based navigation (directly resulting from and following the SearchSleuth project of prof. Eklund) – discussed mutual utilization and merge of the projects into a single one and another joint publication

- discussion with Peter Goodall in Sydney about the possibility of utilizing our research of Boolean Factor Analysis (BFA) with use of FCA at Dept. Computer Science, Palacky University in his research on the topic of tagging of museum multimedia collection data $\rightarrow$ tags as factors

# Publications

P. Eklund, J. Outrata, T. Wray: *Evaluation of an Algorithm for Updating Formal Concepts based on Incremental Changes to Museum Collection Metadata*. 12 pp., submitted to CLA 2013.

- performance evaluation of the new algorithm for update of the set of formal concepts when incremental modification of input data (introduction, change of attributes and removal of objects) on large real (museum) data
- the algorithm does not require the set of concepts present in data before the modification, it finds the difference between the new and previous set only

J. Outrata: *A lattice-free concept lattice update algorithm based on ∗CbO*. 14 pp., submitted to CLA 2013.

- new algorithm for concept lattice update when incremental modification of input data (introduction, change of attributes and removal of objects)
- the algorithm does not require the concept lattice of data before the modification, it finds the difference between the new and previous lattice only

# Contacts

- acquiring new contacts and establishing research collaboration with group of prof. Eklund: T. Wray, P. Goodall
- discussion and significant development of current research and suggestion of new topics for its further continuation, establishment of collaboration on their research and discussion of topics for further joint collaboration

# Conclusion

- the stay more than fully fulfilled its purpose
- established new research collaboration with one of the significant places for application of formal concept analysis (FCA) in the area of information systems
- started two publications submitted to international conference



Figure: Foto after presentation and demonstration of the new algorithm and agreement on the joint publication, on the foto Tim Wray (on the left), prof. Eklund (in the middle) and dr. Outrata (on the right).