TIETS18 Master's Thesis Seminar in Software Development 2017-2018

Zheying Zhang

UNIVERSITY OF TAMPERE

SIS
SCHOOL OF INFORMATION SCIENCES

Agenda

- General information on the MSc thesis seminar
- Writing an MSc thesis
- Thesis topics and supervisors (an incomplete list)
- Other practical issues in thesis writing

General information

- Participants: SDE program students who plan to finish the thesis in academic year 2017-2018
- Instructors: Zheying Zhang
- Sessions: Wednesday afternoons, 14:15–16, from Period I to Period IV
  - Pactical instructions on writing an MSc thesis, thesis presentations and discussions, guest talks (if there is any), etc.
  - Classroom: Pinni B2077 (PI), Pinni B1083 (PII)
  - A separated track of the thesis seminar may be arranged (e.g. text management and analysis by Prof. Nummenmaa in 2015-2016)
- Information is updated and shared in Moodle: https://learning2.uta.fi/course/view.php?id=11408

The credit units

- Credit units: 5 ects

- Grade: Pass/Fail

- Assignments include
  - A short thesis idea presentation (5-10min)
  - A thesis progress presentation (20min),
    - *a written report on thesis progress (including thesis proposal + literature review (10-15 pages)) shall be submitted to Moodle a week before the scheduled presentation*
  - A final thesis presentation (30min)
  - Being an opponent to prepare for the review (1-2 pages) of a thesis progress report and discuss it in the thesis progress presentation (2 reviews/participant) -> a guideline for preparing for an MSc thesis review will be given
  - Participation in seminar sessions (>1/2 of total no. of sessions)

A thesis progress presentation vs. a final thesis presentation

- **A thesis progress presentation shall include**

  - an introduction to the research field;

  - *tentative questions to be tackled;*

  - *knowledge of the topic:*
    - *Explanation of the key concepts/principles/theory in the thesis work*
    - *An overview and summary of the literature relevant to the topic*
    - *A presentation of the most influential articles/books in the topic area; and*
    - *Thesis writer's own analysis of the topic and related research*

  - *a* brief summary of your progress on the research

- **A final thesis presentation shall include**

  - a brief introduction to the research field;

  - questions to be tackled;

  - importance of the topic;

  - prior research or related research on the topic;

  - approaches to the research (research methods);

  - *a detailed presentation of your own work (analysis of the questions, solutions, evaluation, etc.) in the research; and*

  - discussion of the results, contributions and limitations

Planning the seminar sessions

- Autumn
  - Oct. Sessions for thesis idea presentations and final thesis presentations
  - Nov. & Dec. Sessions for thesis idea, progress, and final thesis presentations

- Spring
  - Jan. & Feb. sessions for last chance thesis idea presentations
  - Jan., Feb., Mar., Apr. & May sessions for thesis progress and final presentation

- Schedule your presenations in autumn 2017
  - Possible Wednesdays in autumn: **20/9, 4/10, 18/10,** 25/10, 1/11, 8/11, 15/11, 22/11, 29/11, 13/12
  - Please plan your presentations in Moodle by 10/10

SIS

Agenda

- General information on the MSc thesis seminar
- **Writing an MSc thesis**
- Thesis topics and supervisors (an incomplete list)
- Other practical issues in thesis writing

What is an MSc thesis

- A compulsory part of studies, typically done in the 2nd study year in the MSc degree programme

- Not a work report

- In principle the expectation is that the student studies some new area (methodology / theory / technology)
  - No scientific new results are expected from an MSc thesis – and you should not demand them from yourself, either.
  - The student is familiar with the basic aspects of his/her field
  - The students has the potential to apply scientific knowledge and methods in practical work, or the potential to engage in independent and serious artistic work

- The length should be between 50-70 pages

Info page of thesis

- All useful links available in Moodle

Credits modes of MSc thesis

- Option 1
  - Maturity test
  - Thesis, 40 ects
- Option 2
  - The thesis work is divided into four phases/components
  - Each phase, 10 ects (https://www10.uta.fi/opas/opintojakso.htm?rid=14728&idx=0&uiLang=en&lang=en&lvv=2017)
  - The maturity test is in the 4th phase
- Select a proper mode for the thesis credits, and agreed with your thesis supervisor on the selected credit mode.

Practical instructions for thesis writers

- Consider the following questions first
  - Have I done the pre-requisite studies? What are missing courses in the HOPS plan?
  - On what subject or field do I want to write my thesis?
  - Am I interested primarily in theory or in practical applications? Do I want to do concrete programming work?
- Identify a thesis topic
  - Define a thesis topic based on your own interests – taking advanced courses that seem interesting or likely your thesis topics
  - Discuss in your working place about a thesis topic. Often a suitable topic can be found.
  - Professor may have some topics for theses – last possibility
- Contacting a possible supervisor
- Write a two or three pages introduction in which problem statement about the topic is include – a thesis proposal to achieve a common understanding about the topic
- Sign on the agreement for MSc thesis supervising
- During the work, discuss your work with your supervisor **regularly** (6 months – 12 months)
  - Literature review, planning and writing, iterations, Turnitin
  - MSc thesis seminar
- When you have finished your work, give your manuscript to the supervisor for their final evaluation
- Write maturity test, do Turnitin check, and submit the thesis for grading

An MSc thesis shall find convincing answers to the questions

- What is the **PROBLEM** you are trying to solve? Or what is the research **QUESTION** you are trying to answer?

  Research problems

- Why is this problem/question **worth** solving/asking? Who would care?

  Importance of the topic

- How have other people in the past tried to solve/answer it?

  Prior research on the topic

- What is your approach to solving/answering this problem? Or what improvement are you making on an existing solution?

  Research approach

- How do you prove that the solution you came up with is a **GOOD** solution?

  Results and evaluation

- How can you demonstrate that your solution works?

Agenda

- General information on the MSc thesis seminar
- Writing an MSc thesis
- **Thesis topics and supervisors (an incomplete list)**
- Other practical issues in thesis writing

What kinds of questions do software engineers investigate?

Table 1. Types of software engineering research questions

Type of question	Examples
Method or means of development	How can we do/create/modify/evolve (or automate doing) X? What is a better way to do/create/modify/evolve X?
Method for analysis or evaluation	How can I evaluate the quality/correctness of X? How do I choose between X and Y?
Design, evaluation, or analysis of a particular instance	How good is Y? What is property X of artifact/method Y? What is a (better) design, implementation, maintenance, or adaptation for application X? How does X compare to Y? What is the current state of X / practice of Y?
Generalization or characterization	Given X, what will Y (necessarily) be? What, exactly, do we mean by X? What are its important characteristics? What is a good formal/empirical model for X? What are the varieties of X, how are they related?
Feasibility study or exploration	Does X even exist, and if so what is it like? Is it possible to accomplish X at all?

Shaw M (2003) Writing Good Software Engineering Research Papers, in Proceedings of the 25th International Conference on Software Engineering, IEEE Computer Society, 2003, pp. 726-736.

Type of results we are expecting

Table 3. Types of software engineering research results

Type of result	Examples
Procedure or technique	New or better way to do some task, such as design, implementation, maintenance, measurement, evaluation, selection from alternatives; includes techniques for implementation, representation, management, and analysis; a technique should be operational—not advice or guidelines, but a procedure
Qualitative or descriptive model	Structure or taxonomy for a problem area; architectural style, framework, or design pattern; non-formal domain analysis, well-grounded checklists, well-argued informal generalizations, guidance for integrating other results, well-organized interesting observations
Empirical model	Empirical predictive model based on observed data
Analytic model	Structural model that permits formal analysis or automatic manipulation
Tool or notation	Implemented tool that embodies a technique; formal language to support a technique or model (should have a calculus, semantics, or other basis for computing or doing inference)
Specific solution, prototype, answer, or judgment	Solution to application problem that shows application of SE principles – may be design, prototype, or full implementation; careful analysis of a system or its development, result of a specific analysis, evaluation, or comparison
Report	Interesting observations, rules of thumb, but not sufficiently general or systematic to rise to the level of a descriptive model.

MSc theses in software development, 2016,

[Theses in TamPub](#)

procedure or technique, empirical model and data analysis, qualitative or descriptive model, specific solution or prototype

- Connecting Mobile Game Advertising with Local Stores
- Discovering children's player typologies with playtests
- Analysis and visualization of traffic signal performances
- A case study of the robustness and the usability of CAPTCHA
- Web Security: Security Methodology for Integrated Website using RESTful Web Services
- Privacy requirements of social networking services
- Estimation of bus connection risk with the use of open bus data
- Detection of traffic events from Finnish social media data
- A collaborative filtering based persona identification in requirements elicitation
- Implementing a Medical Device Software Risk Management Process by ISO 14971 in compliance with Agile Principles
- Application of knowledge discovery in databases : automating manual tasks

MSc theses in software development, 2015,

Theses in TamPub

procedure or technique, empirical model and data analysis, qualitative or descriptive model, specific solution or prototype

- Using Stick-Slip to provide directional forces and kinesthetic feedback on interactive display surfaces
- Using tablet devices to control complex home appliances
- Entity-Relationship Meta-model Databases with Unknown Meta-Attribute Values
- BIM based on-site surveying: Utilization of InfraModel3-models in on-site surveying
- Feasibility Study of a GNSS Tracking Application on Android
- Analysis of requirements incompleteness using metamodel specification
- Software project management anti-patterns in innovation projects
- A framework for evaluating in-vehicle applications regarding safety
- Traffic simulation application based on history data
- Semantic Interoperability in electronic health record: a standardised approach
- RSS v2.0: Spamming, User Experience and Formalization
- Impact of evaluation methods on decision tree accuracy

Topics for MSc theses, by Prof. Jyrki Nummenmaa

- **Software development**
  - Formal software specifications
  - Functional requirements
  - Combining the two mentioned above
- **Databases**
  - Database design
  - Dependency theory
  - OLAP, in particular OLAP design

- **Algorithms**
  - Layout algorithms
  - I have general interest in various other types of algorithmic problems as well
- **Distributed transaction management**
  - Distributed commit protocols
  - Animation and simulation of distributed algorithms

Topics for MSc theses, by Prof. Erkki Mäkinen

- algorithmic methods and automata in software engineering in general

- search-based software engineering

- "bio-inspired" and "nature" computing

Topics for MSc theses, by Zheying Zhang (1/2)

- Techniques, processes, tools or empirical studies of
    - requirements specification, modelling, model transformation
    - metamodeling and domain specific modeling
    - reuse strategy and process improvement
    - Commonality and variability analysis in software product line engineering

SIS

Topics for MSc theses, by Zheying Zhang (2/2)

- mobile app maintenance and evolution (together with Xiaozhou Li)
  - maintenance strategies, change management, user review analysis
  - MoRE tool
  - Changs in mobile apps
- Methodologies for mobile app development in a specific application domain (e.g. mobile learning)

Topics for MSc theses, by Timo Poranen (1/2)

Topics (software development)

- Software development models
- Software development methods
- Software development tools
  - also designing new tools and methods
- Project management
- Software quality
- Project work, innovation projects, group work, communication

SIS

Topics for MSc theses, by Timo Poranen (2/2)

Other topics

- Informatics education (primary and secondary schools)
- Computational thinking
- Contests (programming contests, Bebras - International Challenge on Informatics and Computational Thinking)
- Algorithms, games (chess, go, Morpion Solitaire,...), combinatorial games
- Graph drawing

More information on other thesis supervisors and their topics

- http://www.uta.fi/sis/tie/kaytannot/tutkielmat/ohjaajat.html

Agenda

- General information on the MSc thesis seminar
- Writing an MSc thesis
- Thesis topics and supervisors (an incomplete list)
- **Other practical issues in thesis writing**

General working habits

- Write using your own words
  - No copy-paste even in the early phase of your work, and add quotation marks and source to the copied text
  - Write with your own words
- Start building the reference list from the beginning of your work
  - URL is never enough! Write down all possible information
  - Make an annotated bibliography, i.e. keywords, summaries
- Mark the used source immediately when writing a text based on the source
  - Mark the sources where you used them, not always in the end of a paragraph

Finding References

- Find theses from the uta thesis database at: http://tampub.uta.fi/
- Several search engines exist for scientific papers
  - IEEE Xplore consists IEEE's journals, conference proceedings and magazines.
  - ACM Digital Library - the guide to computing literature has ACM's publications.
  - Springerlink publishes books, journals, etc.
  - CiteSeerX is a Scientific Literature Digital Library that also lists how scientific papers refer to each others.
  - Google Scholar is a nice search engine for scientific information (bibtex entries available).
- White papers from corporate are generally considered as marketing

Templates and tools

- If possible, use a template from the beginning of the writing
  - Practical instructions for thesis writers,
  - You see possible problems early enough
  - You see how long you still need to write/how much you still have room for your text

  - http://www.uta.fi/sis/en/tie/studypractices/thesis/index/thesis.rtf

Other tips

- Writing is a personal thing
  - If you got stuck, write some other part of the work or draw a picture and explain it.
  - You can start from the middle, not from the beginning, it is usually easier.
  - Try to divide your work to smaller pieces.
- Plan the timetable well
  - Make a writing plan
  - Take into account other things that affect your writing, e.g. courses and their deadlines, your supervisor's holidays etc.
  - Take into account the iterations, revision, etc.
- Use Turnitin for originality check and new references in the writing iterations
- Evaluating an MSc thesis: knowing what will be reviewed helps you to write the MSc thesis

SIS

"The best thesis is a finished thesis!"

Next Session is given in the library

- **Oct 4** at 12-14
- Linna library's classroom Akseli (room 3021)
- Training session on searching for literature in software development

SIS