Guidelines concerning ethics and academic honesty for student research projects, Masters theses, and PhD theses
Guttorm Sindre, IDI, 2009, slightly revised 2013

These types of research works are to be conducted according to the same ethical standards that would apply for professional / senior researchers in the field, and failure to follow these ethical standards may in the worst case lead to accusations of cheating and/or failure to pass the course in question.

The following are examples of unethical conduct:

a) **Plagiarism:** Presenting somebody else's text, ideas or findings as your own. One example would be usage of material from web or paper documents without giving proper references to these sources, or directly quoting source material in your report without properly marking such passages as quotations. Some concerns:
   - Direct quotations: Directly cited text or diagrams should be clearly marked as quotes and with the reference and page number for the source included. For instance [5] (p.99): "..." with an in-paragraph quotation if it is a fairly short piece of text. If it is a longer quotation, such as an entire paragraph or more, it might be better to separate it as in an own paragraph, properly marked with (begin quotation) before it and (end quotation) after it, and again of course with the proper reference and page number(s). For diagrams or tables taken from a source, this should be indicated by proper reference with page number both in the caption and in the text where the diagram is explained.
   - Rephrasing: You may rephrase a piece of text or slightly adapt a diagram so that it is no longer a direct copy of the original source. But notice that as long as the ideas expressed remain largely the same and these were originally somebody else's ideas, you will still be guilty of plagiarism if presenting this as your own ideas. Thus, the key to avoiding plagiarism is to always give proper credit to the originator, by an explicit quote if the material is identical, and by proper references and explanations if not.
   - Another example of plagiarism would be reuse of somebody else's code (even if it was freely available open source code) in your prototype, without acknowledging that such reuse took place - or reuse of somebody else's experimental data pretending it was data from own experiments. The correct way to proceed here would be to obtain permission from the originator to use the code or data in question, and to explain in the material you publish where these resources were acquired.
   - Related to the ethical issue of plagiarism, but not identical to it, is the legal concept of copyright infringement, which means publication of material for which somebody else holds the copyright, without having permission from the copyright holder. Many examples of plagiarism would also be examples of copyright infringement, but it is possible to be guilty of plagiarism without breaking any copyright laws, for instance if the original text that you copied, was not copyrighted. Also it would be possible to break copyright law without plagiarizing. For instance if I write and publish a book manuscript including a text like follows: *"In their seminal work Information, Systems, and Information Systems, Checkland & Holwell (1997) state (p. 18-117): (begin quote) ".... ". (end quote). I agree with this."* Here the ... are meant to be replaced with the

direct quotation of the source text, starting at p.18 and ending at p.117, i.e., a 100 page direct quotation. Assuming my book manuscript contains a proper bibliographic reference to the Checkland & Holwell book, I have clearly given appropriate credit to the original authors here, thus no plagiarism. However, publishing in a manuscript of my own 100 pages of copyrighted text, so that people might read this rather than buying the original book, the copyright holder could easily sue me for copyright infringement. So, while plagiarism is avoided by giving proper credit to the originator, copyright infringement must be avoided by reproducing only reasonable amounts of the original material (for instance in the above example, maybe just one key sentence to show their definition of an important concept, rather than 100 pages), and to obtain permission from the copyright holder where necessary, for instance if you want to reproduce pictures, diagrams or larger fragments of text from a previous publication.

- A particularly "clever" way of unethical behaviour which has aspects of plagiarism is to shortcut an original reference by references to own work. Assume I recently initiated a research project P where I am doing research building on a theory developed by professors X and Y. In my very first scientific paper in project P, I correctly cite the original theory, e.g., *"As a theoretical foundation for this work, we choose the theory of X and Y (2009), which ... (and then comes a page or so explaining the theory and its relevance to my project)."* Happily having this publication accepted in a conference or journal, however, I drop all references to the work of X and Y in my subsequent publications, for instance writing in my next paper: *"For a more detailed explanation of the theoretical foundation for this work, see our previous publication (Sindre, 2013)."* While it would be true that the theoretical foundation was explained in more detail in (Sindre, 2013) than in the paper I am writing now, and the reader - if bothering to find and read that first paper - would then find that the theoretical foundation largely built upon the work of X & Y, it would clearly be more ethically sound to explicitly refer to X & Y also in my second paper on the topic (instead of, or in addition to, my own paper), as long as the theory of X & Y remains an important basis for my work. Otherwise, a reader who does not bother to check the first paper of project P but simply reads the second one, may get the false impression that the theoretical basis was developed by myself within project P rather than taken from elsewhere.

b) **Unfair/unacknowledged assistance:** Presenting something as entirely your own work when in reality you received assistance which has not been explicitly declared. One example would be buying your report or parts thereof from a web agency, another to have a friend write some chapters or perform part of the underlying work (e.g., coding, statistical analysis) rather than doing it yourself, and without acknowledging that this work was indeed done by somebody else.

c) **Multiple submission / dishonest reuse of own material:** Generally, it is not acceptable to submit for a project report or Masters thesis material that you have already earned study points for in another context, whether at the NTNU or at another educational institution. For instance, if you previously got a Masters degree at another university, it would be unreasonable to reuse that Masters thesis and thus earn double credit for the same work, and the same applies, e.g., to the prospect of reusing in a

project report material that you also got credit for as a term paper in a previous or parallel lecture course. The same applies to submitting the same or too similar papers to several different journals or conferences, as most journals and conferences clearly state that submitted material should be original, i.e., not published elsewhere, and not under review for publication elsewhere.

d) **Fabrication:** This would cover any attempt to present research findings in an untrue manner. The typical example of fabrication would be faking or altering empirical data (for instance from experiments) to make them fit your hypothesis. The most extreme case would be to fake a whole series of experiments, making up your entire data set. Most fabrications are less extreme, for instance the experiment was for real, and most of the data set was kept as-is, but the researcher alters or omits some data to achieve statistically significant results. This would still be unethical. There might of course be cases where it could be fair to argue that some data points should be disregarded as outliers, but if so, you must be explicit about this - both what was done and why - so that this aspect of the data analysis is transparent to the reader. Other examples of fabrication: pretending to have performed tests, interviews or other investigations that really did not take place, manipulating what subjects said in interviews to make this fit your own argument, faking or altering output traces from software prototypes or simulations that actually failed to run as expected, claiming that your software prototype works when it actually does not (and maybe presenting as run-time screenshots something that is really just static sketches), citing non-existent sources, contriving non-existent quotes, etc. In addition to fabrication of research results, fabrication in ones CV would also be an issue of academic dishonesty - and in some cases also punishable crimes - for instance presenting fake degrees or altering grade transcripts for job or grant applications. Specifically for publications, it would be unethical to list an article as peer-reviewed when you know or suspect that it was not really reviewed by anyone.

e) **Unauthorized collection and disclosure** of sensitive or confidential material: If you come across confidential material in the course of your research, you must take care not to disclose this in any way (neither in your report nor during the research) unless permission is given from the owner of the material. In many cases it could even be illegal to be in possession of such material. Some more detailed considerations:
   - Proper handling of confidentiality issues may be particularly important if you cooperate with companies and there are potential commercial interests involved. On the other hand, a student writing a thesis (master or phd) has to publish results, so one should not accept or embark on projects where there are too many limitations on what can be published. See also NTNU's rules for Intellectual Property Rights: http://www.ntnu.edu/business/intellectual-property-rights which point you onwards to more information or people to ask if in doubt.
   - If your research project involves the usage of medical / patient data, see the web page http://www.ntnu.no/studier/phd/personopplysninger for rules on how to proceed.
   - More generally, if your research includes collection of personal information from or about people, you may be required to file an application to NSD to obtain permission for the project. Such an application must be sent at least 30 days before the data collection begins, cf. http://www.nsd.uib.no/personvern/forsk_stud/skjema.html

- In many such projects where an application to use certain data must be filed, it is not necessarily the case that every student on the project must file an individual application, rather the project leader or supervisor could file an application covering the work of several students. But even if somebody else is responsible for filing the application, you as student have an <u>individual responsibility</u> at least to ascertain yourself that such an application has been filed and granted, and a copy of the official permission to use the data should be attached with the report you deliver.
- A special example about confidentiality which can be relevant for phd students, less likely for master students, is if you get access to a yet <u>unpublished scientific article</u> because you or somebody else in your research group (e.g., your supervisor) are <u>reviewing</u> the article for a journal or conference. Even if the material in such a paper might be extremely relevant for your own research, you cannot use it in any way, nor reference it, since it is not yet published. Making use of any such unpublished ideas in your own writings might in the worst case cause you to publish something about this before the original author, thus abusing your (or your supervisor's) role as a reviewer. You can however look up previously published material from the same research group to check if this contains something that you could use and refer to.
- Another example about confidentiality: the review process for scientific papers is normally conducted either as single-blind (author does not know who the reviewer is, but the reviewer knows the name of the author) or double-blind review (neither author nor reviewer know the other's identity). In either case, authors should make no attempt to find out who is or was reviewing their paper, and in the latter case, the reviewer should not make any attempt to establish the identity of the author (except after the paper is accepted, when identity of the author will necessarily be revealed when the paper is published).

f) **Research with harmful effects**. This could be either in the sense that the end product is dangerous, or that procedures followed during the research may be harmful to people, property, or environment. The classical example would be experiments with human subjects, where it should be ensured that these are not harmful to the participants. Even if most experiments where participants try out new ICT products or ICT engineering techniques might not have any likely effects of serious harm, less severe consequences should also be taken into account. For instance, if students participate in an experiment in the context of a course (e.g., as part of a compulsory exercise in that course), alternative treatments should not have an impact on the students' grades (since otherwise, it would be unfair for students who received the poorest treatment). Also, one should be careful to avoid the situation that the pedagogical value of the exercise is sacrificed in favour of, e.g., statistical significance or easy coding of the results. In our field, it is also important to consider potential harm caused to or by ICT systems, and one example of unethical conduct might be to undertake development of software that you know or suspect will be used for harmful purposes, or to release into a production context an ICT artefact that has not been sufficiently quality assured. If you are performing research on computer viruses or other malware, you must take extreme care not to release such malware outside the experimental sandbox or make it available to potential computer criminals.

g) **Incorrect co-authorship.** This is not so relevant for the project report or thesis itself, where the student would normally be the sole author. However, if any papers in

conferences or journals result from the work, it is important that those who have contributed substantially to the paper are listed as co-authors. Some considerations here:

- The "Vancouver convention" http://www.icmje.org/ethical_1author.html gives some guidelines for what is a sufficient contribution to a paper to be included as author. Possible ways to fail here are either to include in the author list a person who did not contribute to the paper, or to exclude from the author list a person who did contribute to the paper. Normally, it would be natural to include your thesis supervisor, since a well-working supervision relationship should mean that the supervisor was involved both in conceiving the ideas behind the paper and in the concrete development of the paper. Nevertheless, the Vancouver convention entails that if this was not the case, and you write a paper which the supervisor had absolutely no involvement in, it would be incorrect to post the supervisor as co-author.

- The order of authors on the paper may also be important, but what is normal practice here may vary from field to field (and even between different research groups in the same field). If all authors have contributed equally much, alphabetical order would be the most common. If degree of contribution varies, it would be natural to present authors by this degree, rather than alphabetically. In some fields, the last author position is also considered significant, often being reserved for the person who led or supervised the work. Given the perceived importance of order, it might be considered unethical to use an order which gives a false impression of the respective contributions. Also, it is a good idea for authors to agree on the order already at the point of submission, so that this does not become an issue of dispute at a later stage. Following from this, another advice would be:

- Never submit a paper without the agreement of your co-authors, i.e., co-authors should be made aware that you are planning to submit the paper and have responded that the submission is ok with them before you actually submit the paper. Moreover, you should always check that you have the time and funding to go to a conference before submitting there, since acceptance implies an obligation to travel to the conference to present the paper.

- If you are planning a phd thesis in the form of a paper collection, and some of your papers have co-authors, you will be obliged to attach with your thesis a one-page declaration for each such paper, containing the bibliographic information of the paper, a specification of each person's contribution to the research and writing of the paper (e.g., what parts of the research work or writing did each person contribute to, possibly also an estimate of the percentage of contribution for each person), and the signature of all authors. A good advice here might be to write this declaration and have it signed by all authors as early as possible, rather than waiting till just before delivering your thesis. Although the latter tends to work out fine, too, there have been examples of the opposite - for instance that one co-author had moved to another country and was sick and therefore hard to get in touch with for the signature. Also, it could be easier to write and agree upon the statement about each author's contribution when this is fresh in everybody's memory.

More information on research ethics can be found at http://www.ntnu.no/etikkportalen . Also, there are national committees for ethics in research, cf. http://www.etikkom.no/, whose web pages can be consulted, and who can also be contacted if in doubt about the ethics of a

research project (but the natural first contact for discussion would be your supervisor). For most projects within ICT, the guidelines from the committee for science and technology research would be most relevant, cf. http://www.etikkom.no/retningslinjer/nent - they also have a checklist for research ethics, http://www.etikkom.no/retningslinjer/sjekkliste . In some cases your research might also be such that information from the other committees (Medical Research, Social Research) could be relevant.

The IEEE Code of Ethics http://www.ieee.org/portal/pages/iportals/aboutus/ethics/code.html and the ACM Code of Ethics http://www.acm.org/about/code-of-ethics are also useful guidelines for your research efforts, as well as for your future career as an ICT professional.