

LTCC Proposed Course

- Title: Causal Inference
- Basic Details:
 - Core Audience: 1st year, stats
 - Course Format: intensive (8 hours)
- Course Description:
 - Syllabus:
 - 1) Introduction (1h):
the difference between association and causation.
 - 2) Mathematical frameworks for causal reasoning (2h):
potential outcomes, do-operator, decision theory, structural equations; definition of causal effects; identifiability of causal effects.
 - 3) Causal directed graphs and influence diagrams (1h).
representing background knowledge, graphical criteria for identifiability.
 - 4) Methods of causal inference (2h):
adjusting for confounding; inverse probability of treatment weighting, propensity scores; instrumental variables.
 - 5) Special topics (2h):
direct and indirect effects, sequential and dynamic treatments, causal search.
Throughout: examples and exercises based on bio-medical and social sciences applications.
 - Recommended reading: J.Pearl (2000). *Causality - Models, Reasoning and Inference*. Cambridge University Press.
 - Additional Optional reading:
 - Dawid, A.P. (2002). Influence diagrams for causal modelling and inference. *Int. Statist. Rev.*, **70**, pp. 161-89.
 - Didelez, V., Sheehan, N. (2007). Mendelian randomisation as an instrumental variable approach to causal inference. *Statist. Meth. in Med. Res.*, **16**, 309-330.
 - Prerequisites: Probability theory, (generalised) linear models; for exercises: R and bootstrap.
- Format:
 - No of discussion/problem sheets: one with solutions.
 - Electronic lecture notes: notes or slides will be made available in electronic format.
 - Necessary support facilities: laptops or computers
 - Necessary software requirements for computing facilities: R
 - Proposed timing: May 2009
 - Lecture/computer session/tutorial/discussion split (hours of each): 6h lectures (there will be short exercises and discussions during the lectures), 2h computing/exercises
- Lecturer Details:
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