CLASSIFICATION AND THE SURVIVAL ANALYSES IN THE ARTREAT PROJECT

Goran Rakocevic
Zoran Babovic
Marko Novakovic
Nenad Korolija
Veljko Milutinovic
ATHEROSCLEROSIS

- Why is atherosclerosis important?
- It is a CVD (Cardiovascular Disease)
• Atherosclerosis is the condition in which an artery wall thickens as the result of a build-up of fatty materials such as cholesterol.
ATHEROSCLEROSIS

• Etiology: Injury to the artery wall initially patched by LDL plasma proteins
  o LDL plasma proteins invite white blood cells which cause an inflammatory response and finalize the patching of injured arterial walls
  o Cholesterol and triglycerides attached to the LDL proteins are not removed by HDL
  o The cholesterol oxydizes and hardens, stiffening the arterial wall,
•  Irreversible hardening or arteries
• Atherosclerosis is chronic and cumulative
• How atherosclerosis affects the organism?
  o obstruction of blood flow causing slow tissue death.
  o plaque ruptures forming thrombus
    - complete blockage?
    - tissue death within 5 minutes.

*The tissue involved is that which is fed by the blocked artery. *This thrombus related tissue death is what we call and infarction. This same process within the blood vessels of the brain is called a stroke.
ATHEROSCLEROSIS

• Why is atherosclerosis interesting for research?
  • affects the entire artery tree,
    • the coronary
    • Renal
    • Femoral
    • Cerebral
    • Carotid arteries.
THE ARTREAT PROJECT

• ARTreat targets at providing a computational model of the cardiovascular system, to improve prediction for the atherosclerosis progression and propagation into life-threatening events.

• An FP7 Large-scale Integrating Project (IP)

• 16 partners

• Funding: 10,000,000 €
ARTREAT GOALS

• ARTreat provides a **three-level patient model** describing the 3d arterial tree anatomy, the patient-specific blood flow and blood particle dynamics and the biological processes that lead to the creation and progression of atherosclerotic plaques.
• Provide patient specific model of arterial tree for clinical decision support and training
• Etiology of Atherosclerosis (e.g. genetic, fatty intake etc.)
THE DATA

• 3000 patients with 97 attributes

• 450 patients with genetic profiles

• 400 patients with repeated angiographies

• 600 patients with scintigraphies
CLASSIFICATION:
HARD EVENTS

• Divide patients into:
those who had an event vs. those who did not
(group patients with similar anamnesis together)
CLASSIFICATION: HARD EVENTS

• Interventions in most severe cases change patient characteristics (they change the anamnesis)

• Hard event classification became meaningless

• A *MACE study (Major Adverse Cardiac Events)

• Better results, still not sufficient

*objective measures of acute and/or adverse cardiovascular events which are used to assess the effects of various interventions (e.g., rotablation, angioplasty, stenting) or therapeutics on outcomes, in the context of a clinical trial.
SURVIVAL ANALYSES

- Type of problems:
  - Study over a period of time
  - In the course of study an event either happens or not
  - Not just about if, but also when
THE KAPLAN-MEIER ESTIMATOR

an estimator for estimating the survival function from lifetime data.
COX REGRESSION

- Proportional Hazards assumption
- Omits the underlying hazard function
- Gives only a Hazard Ratio
- Relatively Simple, and often sufficient
- Easy to add time varying predictors and covarities
Thank You