Computational methods for Medical Physics

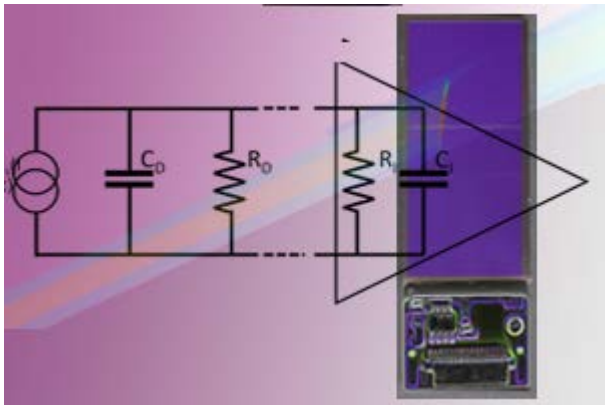
Dr. George DEDES
LS PARODI

WS 2016 - 2017

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Activities of the Medical Physics Chair of LMU

- The Medical Physics Chair of LMU (LS Parodi), with its research activities, covers a large variety of research topics from the field of Medical Physics:
  - Dosimetry and Beam Monitoring
  - Medical Imaging
  - Adaptive Radiotherapy
  - Monte Carlo Simulations
  - Laser Ion Acceleration
  - Nuclear Science



- Detailed information and contact people to be found in:

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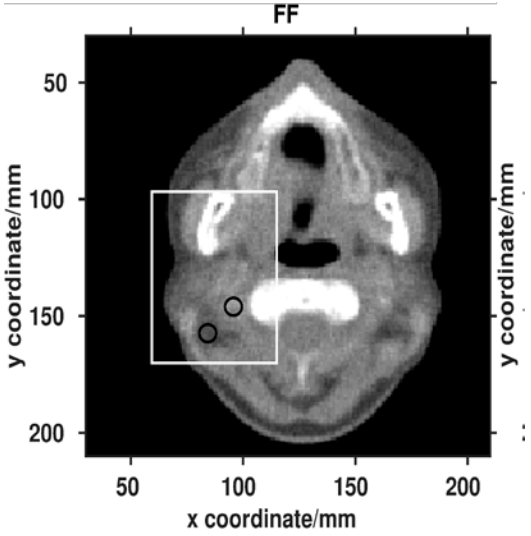

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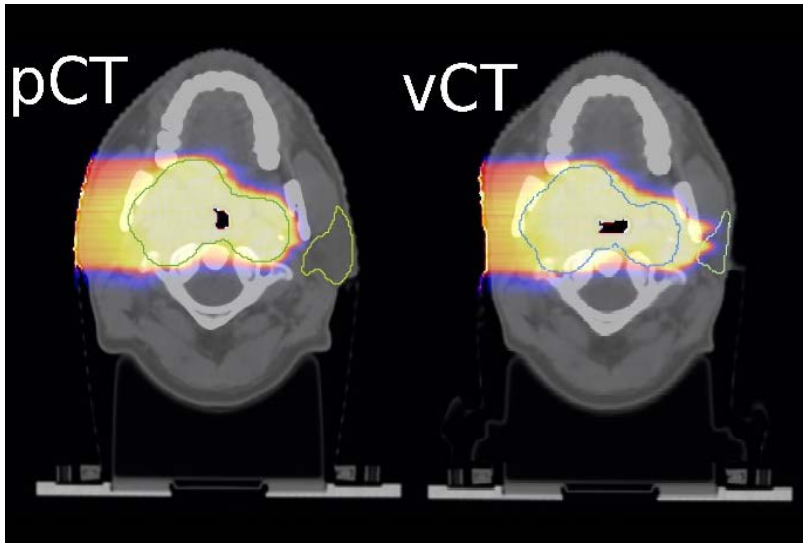

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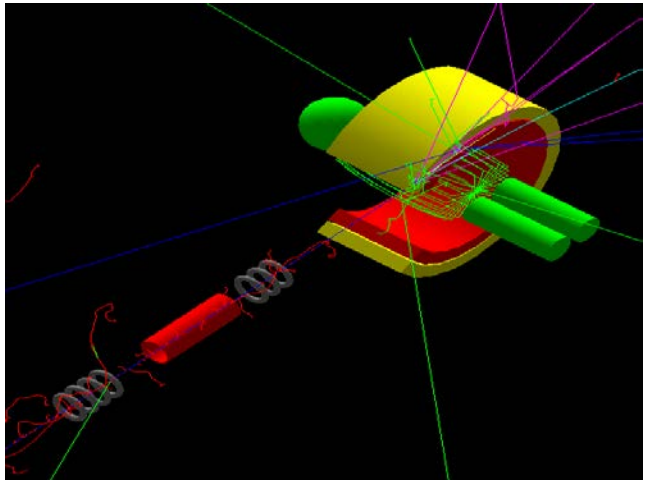

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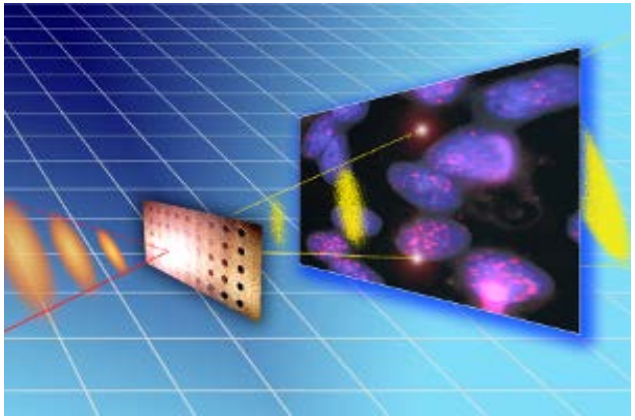

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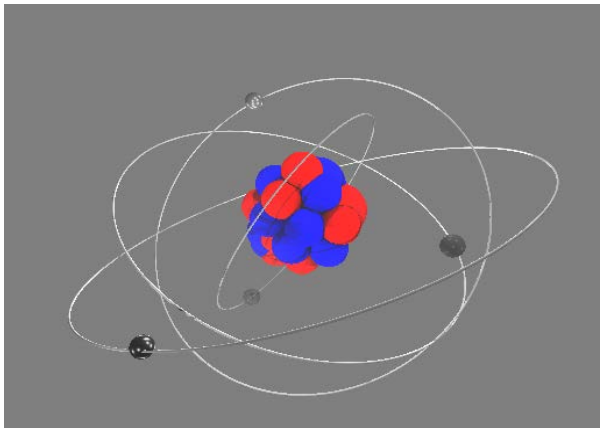

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Computational Tools

- Within these activities we need to use a broad variety of software/computing tools and apply different computational methods in order to solve (complex) mathematical/physical problems

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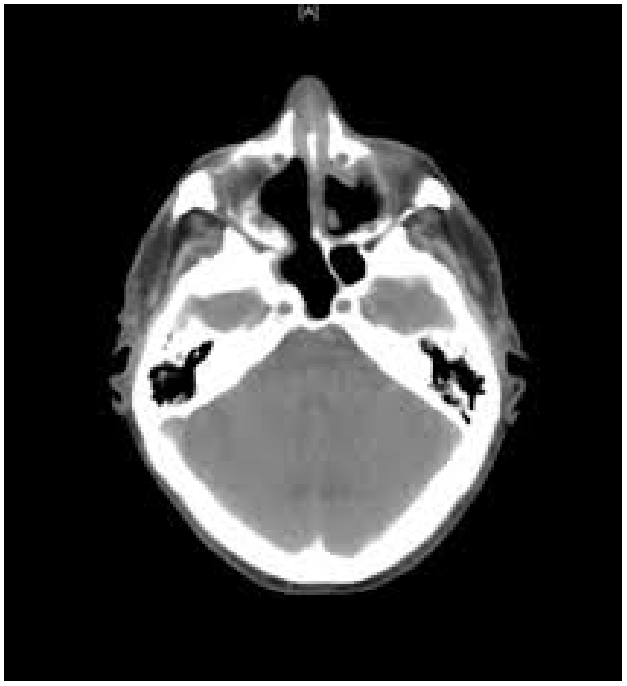
- For example, all the tools/methods we need to go from a real patient CT provided by the hospital, to a realistically simulated dose calculation with MC techniques



Lecture Goals

- The scope of this lecture:
  - Present some of the methods used in our research activities
  - Expose the fundamentals of those methods
  - Explore their actual implementation
  - Discuss examples where the method was used for the solution of a specific problem
  - Wherever possible, write small programs using those methods in the form of homework (bonus in the final grade)

Lecture Scope

- Approximate structure and topics:
  - Tuesdays, 10:15 AM, HU123
  - Teachers: Dr. George Dedes
    Dr. Chiara Gianoli

- Monte Carlo (MC) techniques and simulation
- Particle transport/interaction modeling using MC
- Dose calculation algorithms in external photon therapy
- Inverse planning and optimization in radiation therapy
- Basic medical imaging concepts
- Hands-on part with FLUKA

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    chiara.gianoli@physik.uni-muenchen.de

Lecture Specifics

- Slides with additional info on the blackboard
- When there is something very important in the text that you ought to definitely keep in mind, it will be in black color
- Effort to have as many references to the original sources as possible
- The lecture is more profitable for you if it is interactive. So participate!
- Off to the first part!