***TechMed Innovation Summer School*** at Leiden

**Concept Program**

DAY 1 **IMAGING OF CANCER**

DAY 2 **THE OPERATING ROOM OF THE FUTURE**

DAY 3 **INTRAMURAL & EXTRAMURAL HEALTH CARE** **for the VULNERABLE PATIENT**

DAY 4 **CLINICAL APPLICABILITY of ARTIFICIAL INTELLIGENCE and E-HEALTH**

**Target group**

Our main target group are highly talented (post) Msc students (Technical medicine, Medicine, Biomedical Sciences, Biomedical Engineering, Computer Sciences), PhD students, young medical specialists with technological interest, (junior) postdocs. The participants are pioneers and are capable of out of the box thinking and have the ambition to contribute to the integration of medicine and technology, thus advancing personalized care and patient safety.

The reason why we want to focus on this group is that on one hand technological developments already have changed healthcare immensely, and will keep transforming healthcare and drive innovation to improve personalized care, patient safety and quality of intra- and extramural healthcare. But on the other hand the integration of innovative technologies and technological research in health care, and insight in the immediate applicability in patient care, is still too limited and is not yet as widely supported as we need it to be to deliver personalized and value-based health care. It is desirable that they are brought together in a short, circumscribed, intensive and inspiring program, where they will collaborate and will become aware of the bridge function that they are going to fulfill while delivering personalized high-quality care. Furthermore, and importantly, it is still a fact that these professionals do not find each other easily by themselves but will need each other in the nearby future as collaborating colleagues to jointly shape the development and application of innovative technologies in health care.

Participants: 25-35

Groups of 4 persons , maxim 8 or 9 groups

General structure:

* In the morning: short (Ted talk like ) lectures of 20 minutes, 5 minutes discussion
* In afternoon:
  + Working on research proposal & presentation, in small groups of 4 persons (so 8 or 9 groups)
  + Carrousel of hands-on practical experiences
  + Opportunity to consult with experts in the field on assignment.
* Assignment
  + is given on day one
  + probably 8 or 9 different TechMed assignments
  + all subjects (as discussed on day 1,2, 3, ) will be covered and the day-coordinators will develop 2 or 3 assignments.
  + students will be given material to study in advance to be able to work on the assignment from day 1 onwards, till presentation on day 3
    - so, assignments includes imaging of cancer, sustainability ( what are the opportunities?) global health, intramural and extramural care for the vulnerable patient.

**DAY 1 IMAGING OF CANCER**

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| Precourse material |  |  |  |  |

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| *Date & time* | ***Title*** | ***Speaker*** | ***Subject*** | ***Specifics*** |
| 08:30 – 08:45 | **Introduction TechMed Summerschool at Leiden** | **Dr. M. Sesmu Arbous** (LUMC) | Mission, vision, aims Summerschool  Practical information | How can we strengthen the bridge between the medical specialists and the engineers ? |
| 08:45 - 09:20 | **‘Who is who’** | All participants |  | Beforehand participants and faculty prepare 2 questions: “Who are you & personal goals” to be shown with picture |
| 09:20 - 09:45 | **A journey through unclear imagination?!** | **Dr. Dennis Vriens** (LUMC) | PET and SPECT | In this short overview I will take you through some basic nuclear physics and camera technology, ending with real clinical examples. Afterwards you understand what working on the crossroads of physics, chemistry and medicine means in daily practice. |
| 09:45 - 10:10 | **MRI innovations for oncology** | **Dr. Nathalie Doorenweerd** (LUMC) | MRI | Developments in MRI for oncology aim to achieve better contrast and tumour delineation in a shorter amount of time. Classic image sequences include diffusion weighted imaging and dynamic contrast enhancement which will be explained. In addition, exciting new hardware implementations such as MR-Linac or custom coil designs will be described. |
| 10:10 - 10:45 | **Coffee break & visit Exhibition** |  |  |  |
| 10:45 - 11:10 | **CT in cancer imaging: is there still room for improvement?** | **Drs. Bas Boekestijn** (LUMC) | CT | Computed tomography (CT) is a well-established imaging method and features of malignancies have already been investigated extensively. However, new techniques are still being developed and implemented. In this talk new developments such as improvements in resolution, CT perfusion and texture analysis will be discussed. |
| 11:10 - 11:35 | **Technical uncertainties in clinical proton therapy.** | **Prof. dr. Marco van Vulpen** (LUMC) | Radiotherapy planning | Although physical uncertainties are less in photon therapy, proton therapy offers in theory major gain in dose delivery. Here technical uncertainties in proton therapy are explained, including possible solutions. |
| 11:25 - 11:50 | **Theranostic, driving the future of nuclear medicine?** | **Prof. dr. Lioe-Fee de Geus-Oei** (LUMC) | Radionuclide therapy | Nuclear medicine thrives by continuous changes. The current decade a wave of new theranostic compounds, targeting the same receptor for imaging and therapy, will change the oncology therapeutic arsenal. |
| 11:50 - 12:15 | **Assignment TechMed Research Proposal** | **By Faculty members** |  | The research assignments will be presented. In the coming days small groups will work on projects related to challenging technical-medical problems. |
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| 12:15 – 13:15 | **Lunch & visit Exhibition** |  |  |  |
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| 13:15 - 14:00 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants in small groups | Workshop or research project | **Workshop 1:** Ultrasound hands on – Drs. Murat Özdemir |
| 14:00 – 14:45 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants in small groups | Workshop or research project | **Workshop 2**: Hands on course Interventional Oncology - Dr Mark Burgmans |
| 14:45 – 15:15 | **Tea break** |  |  |  |
| 15:15 - 16:00 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants in small groups | Workshop or research project | **Workshop 3:** Imaging Services group - Dr Willem Grootjans |
| 16:00 - 16:45 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants in small groups | Workshop or research project |  |
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| 16:45 – 18:00 | **Visit Exhibiotion & at leisure** |  |  |  |
| 18:00 – 20:00 | **Diner at the LUMC** | All participants & Faculty |  |  |
|  | **Rest of evening free** |  |  |  |

**DAY 2 THE OPERATING ROOM OF THE FUTURE**

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| Precourse material |  |  |  |  |

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| *Date & time* | ***Title*** | ***Speaker*** | ***Subject*** | ***Specifics*** |
| 08:30 - 08:55 | **The green OR: mission impossible?** | **Prof. dr Frank Willem Jansen** | Sustainability on the OR | *Due to the signed agreement of the Green Deal 2.0 by care providers, Hospitals have to implement their appointment to reduce their CO2 footprint to aneutral level in 2050. The OR is one of the most polluting areas in Hospitals. How to get a CO2 reduction in the OR and minimize its other pollution (volatile anaesthetics, use of plastic, harmful production processes)? What are the technical challenges. To measure is to know* |
| 08:55 - 09:20 | **Circularity: the ultimate option in technical design of instruments** | **Dr. ir T. Horeman** (TUDelft) | Reusable or disposable surgical instruments in the OR | *The discussion to purchase reusable or disposable surgical instruments has probably been settled by circular design of new instruments. However, is that a challenging opportunity? Or fake news?* |
| 09:20 - 09:45 | **Digital Operating Room Assistant (DORA): process management of the future** | **Dr. J.J. van den Dobbelsteen** (TUDelft) | Automated planning of the OR process | *Planning of the OR processes is currently still performed by human beings. This is not only an intensive process, but also costly. By implementing new technical features, this process can be automated and optimized. What are the missing links?* |
| 09:45 - 10:10 | **Technology application in developing countries: challenges or opportunities ?** | **Prof. dr Jenny Dankelman** (TUDelft) | Positioning of technology in the OR in developing countries | *SMART technological tools, like iPhones, bring the 3rd world nearer to the developed countries and create chances to implement new surgical techniques as minimally invasive surgery. However, simple and applicable instruments and technologies have to be developed for these countries based on techniques and technologies of the developed countries. How to succeed? Where is the opening to get easier implementation* |
| 10:10 - 10:45 | **Coffee break & visit Exhibition** |  |  |  |
| 10:45 - 11:00 | **Visual planning of surgery: 3D as option?** | **Dhr Roy P.J. van den Ende Msc / prof. dr Maal** | Visual planning on the OR by 3D technology | *Again a new challenging option to work on in the near future. Does it add anything or is the surgeon’s skills and eye irreplaceable? How to develop 3D broader, and on which indication is it applicable* |
| 11:00 - 11:25 | **Augmented reality for intraoperative visualization: an implementation tool?** | **Porf. Dr. Th.J.M. Ruers** (AvL) | Augmented reality in the OR | *This new tool is not only challenging, but also gives (probably) a better pre-operative imaging of planned operation. Is it worth to implement that new feature? How does it work and where do we have to work on to get it implemented?* |
| 11:25 - 11:50 | **Fluorescence guided surgery - from bench to bedside** | **Dr. Alexander L. Vahrmeijer** (LUMC) | Fluorescence guided surgery |  |
| 11;50 – 12:15 | **Intra-operative optical imaging: optional or future** | **Dr. Fijs W.B.van Leeuwen** (LUMC) | Role of nuclear guided surgery | *New technologies are developed and implemented in surgery. How does it work and on which indication are these new features applicable? Daydreaming or reality?* |
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| 12:15 – 13:15 | **Lunch & visit Exhibition** |  |  |  |
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| 13:15 - 14:00 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants in 8 groups of 4 | Workshop or research project | **Workshop 4:** Robotica - dr Fijs van Leeuwen, prof dr J. van der Hage |
| 14:00 - 14:45 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants in 8 groups of 4 | Workshop or research project | **Workshop 5:** 3D Lab - drs Roy van den Ende Msc |
| 14:45 – 15:15 | **Tea break** |  |  |  |
| 15:15 - 16:00 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants & Faculty | Workshop or research project |  |
| 16:00 - 16:45 | **Carousel of Workshops or**  **Prepare research proposal in small groups** | All participants & Faculty | Workshop or research project |  |
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| 16:45 – 18:00 | **Q &A and consultation with specialists for research proposal at Exhibiotion site** |  |  |  |
| 18:00 – 19:30 | **Boat tour & Drinks on Leiden Canals** | All participants & Faculty |  |  |
|  | **rest of evening free for individual dinner in Leiden** |  |  |  |

**DAY 3 INTRAMURAL & EXTRAMURAL HEALTH CARE of the VULNERABLE PATIENT**

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| Precourse material | Unmet needs in diagnostics, prognostics or therapy of the vulnerable patient with mobility problems |  | ICF model, biopsychosocial model; |  |

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| *Date & time* | ***Title*** | ***Speaker*** | ***Subject*** | ***Specifics*** |
| 08:30 - 08:55 | **The ICF model and biopsychosocial approach of the vulnerable patient** | **Dr. Sven K. Schiemanck** (LUMC) | Vulnerable patient |  |
| 08:55 - 09:20 | **The vulnerable patient: fall risk in elderly** | **Dr. Monica van Eijk** | To avoid hip fracture in elderly with high risk of falling: signaling and prevention |  |
| 09:20 - 09:45 | **Gait analysis** | **Prof. Dr ir Jaap Harlaar** (TUDelft) | Two stage mobility diagnostics |  |
| 09:45 - 10:10 | **Navigation and mobility: the influence of neurocognition** | **Dr. Ineke van der Ham** | Serious gaming in assessing cognitive disturbances of influence in navigation |  |
| 10:10 - 10:45 | **Coffee break & visit Exhibition** |  |  |  |
| 10:45 -11:00 | **Wearables in health care, particularly for the vulnerable patient?** | **t.b.a. (Rutger Goekoop or Jan Peter Larsen)** | The use of wearables in assessing functional limitations of the patient.  Blended care**.** |  |
| 11:00 – 11:25 | ***E-health for* diagnostics and therapeutics in primary care** | **Prof. dr Niels H.Chavannes** (LUMC) | A framework for implementation of eHealth applications that do work |  |
| 11:25- 12:15 | **Carousel of Workshop/prepare presentation in small groups** | All participants in 8 groups of 4 | Workshop or research project | **Workshop 6:** Technology in Motion (TIM) Lab - drs Marjon Stijntjes Msc/ t.b.a. |
| 12:15 – 13:15 | **Lunch & visit Exhibition** |  |  |  |
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| 13:15 - 14:00 | **Carousel of Workshops/prepare research proposal & presentation in small groups small groups** | All participants in 8 groups of 4 | Workshop or research project | **Workshop 7:** Kinematics) Lab - t.b.a. |
| 14:00 - 14:45 | **Carousel of Workshops/prepare research proposal & presentation in small groups small groups** | All participants in 8 groups of 4 | Workshop or research project |  |
| 14:45 – 15:15 | **Tea break** |  |  |  |
| 15:15 - 16:00 | **Posterpitch & Presentation I** | All participants & Faculty | **Posterpitch & Presentation** |  |
| 16:00 - 16:15 | **Tea break** |  |  |  |
| 16:15 - 17:00 | **Posterpitch & Presentation II** | All participants & Faculty | **Posterpitch & Presentation** |  |
| 17:00 - 18:00 | **Transportation to Noordwijk** |  |  |  |
| 18:00 – 20:00 | **“Moving and motion on the beach”** |  |  |  |
|  | **Beach BBQ** |  |  |  |

**DAY 4 CLINICAL APPLICABILITY of ARTIFICIAL INTELLIGENCE (AI)**

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| *Date & time* | ***Title*** | ***Speaker*** | ***Subject*** | ***Specifics*** |
| 08:30 - 08:55 | **Theoretical foundation of AI, machine learning techniques** | **Prof. dr. Aske Plaat** (LIACS - Leiden Institute of Advanced Computer Science) |  | *AI. Machine Learning explained, particularly clinical applicability* |
| 08:55 - 09:20 | **Ethical aspects of AI** | **Prof. dr Martine C. de Vries** (LUMC) |  |  |
| 09:20 - 09:45 | **Legal aspects of AI** | **Dr. Bart H.M.Custers** (University of Leiden ) |  |  |
| 09:45 - 10:10 | **Sharing of data in health care**  *Framework for trusted re-use of DATA* | **Dr Erik L.A> Flikkenschild** (LUMC) |  |  |
| 10:10 - 10:45 | **Coffee break & visit Exhibition** |  |  |  |
| 10:45 - 11:00 | **Assignment Clinical applicability of AI** | **De Vries / Arbous / Plaat / Cammel** |  |  |
| 11:00 - 11:25 | **AI and Radiomics** | **prof. dr. ir. B.P.F. Lelieveldt** (LUMC) |  |  |
| 11:25 - 12:15 | **Key note lecture**: **AI** and effect on clinical practise | **dr M. Komorowski** (Imperial College London, London) | Personalized medicine on the ICU with AI | *The AI clinician learns optimal treatment strategies for sepsis in the intensive care* |
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| 12:15 – 13:15 | **Lunch & visit Exhibition** |  |  |  |
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| 13:15 - 14:00 | **Prepare presentation in small groups** | All participants in 3 groups of 11-12 | Project | *Preparation in small (three)) groups: “sceptics”, “utopians”, “in-between realists” on position on AI and Big Data in health care* |
| 14:00 - 14:45 | **Prepare presentation in small groups** | All participants in 3 groups of 11-12 | Project |  |
| 14:45 – 15:15 | **Tea break** |  |  |  |
| 15:15 - 16:00 | **Prepare presentation in small groups** | All participants in 3 groups of 11-12 | Project |  |
| 16:00 - 17:05 | ***The Lion’s Den: “NO limits to AI and Big Data in healthcare” (moderators: de Vries, Plaat, Arbous*** | All participants & Faculty | **Pitch in 3 groups *“NO limits to AI and Big Data in healthcare”*** |  |
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| 17:05 – 17:30 | **Closing ceremony & certificates** | All participants & Faculty |  |  |
| 17:30 – 19:00 | **Farewell drinks & bites** | All participants & Faculty |  |  |
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