2019

OMPI Seminar Archive

OMPI Seminar: Ghada Aldosary and Reid Townson, and social outing

Date: Thursday, January 17, 2019
Time: 3:30 - 5:00 pm, Refreshments start at 3:15 pm.
Location: Carleton University, Herzberg 4351

Presentations:

1) Evaluation of MRI image geometric inaccuracy for MRI based treatment planning on GammaPod

by Ghada Aldosary, Carleton University

Supervisor(s): Eric Vandervoort and Claire Foottit

Abstract: The GammaPod™ (Xcision Medical Systems, USA) is an ablative radiation therapy (RT) device dedicated for breast cancer. It relies on computed tomography (CT) images for the RT planning process. Due to its superior soft tissue contrast, better visualization of target structures within the breast can be achieved with magnetic resonance imaging (MRI). However, MRI suffers from geometric inaccuracy—which may lead to unacceptable errors for these precise treatments.

In this talk, our method for quantifying geometric inaccuracy on both CT (helical and C-Arm systems) and MRI based treatment planning images will be presented. Results from an in-house 3D printed phantom, as well as a commercial stereotactic radiosurgery quality assurance phantom will be compared. In preparation for MRI-based treatment planning on GammaPod, the application of these preliminary results will then be presented.

2) Modeling radionuclides with EGSnrc: the dirty details of nuclear data

by Reid Townson, National Research Council (NRC)

Abstract: A radionuclide source model was recently added to the EGSnrc code for Monte Carlo radiation transport. On the surface, this is a useful tool for users to quickly insert complex radionuclide source emissions into their simulations. Delving deeper, I will outline how the model depends on the nuclear data, how decay-by-decay emissions are produced, and the difficult choices that must be made when designing a model based on experimental results.

Social Outing:

For those interested, Spencer Manwell (SpencerManwell@cmail.carleton.ca) has also booked a table at Patty's Pub afterwards for some Mid-Winter cheer!

Address: 1186 Bank St, Ottawa, ON K1S 0W6

https://www.google.com/maps/place/Patty's+Pub/@45.3919038,-75.6817347,15z/data=!4m5!3m4!1s0x0:0x40d294be7e1d3ee2!8m2!3d45.3919038!4d-75.6817347

Driving from Carleton: (5 min)

Take University Dr. to Bronson Ave.
Continue straight onto Sunnyside Ave.
Turn right onto Bank St.
Patty's Pub is on the right, at intersection of Ossington Ave. and Bank St..
Transit from Carleton: (15 min)

Walk to stop at Sunnyside Ave. and Carraway Pvt,
Take 7 St. Laurent until the stop at Grove Ave. and Bank St..
Walking: (20 min)

Exit Carleton campus by the Raven's Nest
Cross Bronson Ave. and continue into Brewer Park
Follow the trails toward Ossington Ave. and continue on to Bank St.

Please RSVP to Spencer, if you're interested in going to Patty's Pub. If you'd also like to partake in an evening skate, please let Spencer know when you RSVP for pub and we can organise a group for those interested (canal conditions permitting of course).

OMPI Seminar: Ghada Aldosary and Reid Townson, and social outing

Date: Thursday, January 31, 2019
Time: 15:30
Location: Herzberg building, room HP4351

Prof. John Kildea
Opal - Empowered Patients, Informed Research
McGill University

Abstract: Opal (opalmedapps.com) is a person-centered patient portal smartphone app that was built at and has been released to cancer patients at the McGill University Health Centre in Montreal. Opal was designed with two goals in mind: (1) to empower patients, and (2) to inform research.

Opal empowers cancer patients with access to their electronic medical records (appointment schedules, lab results, clinical notes, etc) and automatically-personalized educational material tailored to their disease and phase of treatment. For example, it can automatically advise a patient on how to prepare for an upcoming appointment, provide a map of where to go, and facilitate appointment check-in and call-in so that the patient does not need to wait in the waiting room. It can also display the radiotherapy treatment planning process and let patients follow the progress of their treatment plans.

As a research tool, Opal is designed to collect patient-reported outcomes. It is also designed to operate in a multi-institutional context so that patients can communicate with and access all of their data from multiple hospitals at once. With their multi-institution data in hand, consenting patients can donate them to research studies, facilitating patient-powered multi-institutional data linkage for real-world evidence research.

This presentation will describe the history of the Opal project, the technology behind it, the stakeholder co-design process that was used to build it, and the research projects that are now forming around it.

OMPI Seminar: Tong Xu and James Renaud

Date: Thursday, February 28, 2019
Time: 3:30 - 5:00 pm, Refreshments start at 3:15 pm.
Location: National Research Council, Kelvin Room (M36)

Presentations:

1) Calorimetry-based clinical reference dosimetry of a 1.5T MRI-linac in water and solid phantoms using Aerrow

By: James Renaud, PostDoctoral Candidate, National Research Council (NRC)

Supervisor(s): Bryan Muir and Malcolm McEwen.

Abstract: Calorimeters are used as primary standards for absorbed dose measurements in ionizing radiation. Due to the complexity of the systems, and the time required to obtain measurements, they have remained in the standards laboratory and are rarely seen in end-user situations, such as cancer centres. However, calorimetry offers some significant advantages over secondary dosimeter systems and a clinical implementation of a calorimeter would provide new measurement capabilities for the medical physicist.

In this talk, an introduction to Aerrow, a probe-format graphite calorimeter, is provided along with a detailing of its use to perform clinical reference dosimetry in the high-energy photon beam of a 1.5T MRI-linac. Response perturbations due to the presence of the magnetic field, as well as detector orientation dependence – in both water and solid phantoms – are investigated.

2) “A generalized MLC simulation method designed for GPU”

By Tong Xu, Carleton University and NRC

Graphics Process Units (GPU) are very attractive for parallel computing thanks to their low cost per processing core and the ability of integrating thousands of cores in one desktop computer. This talk will start with a brief introduction of a GPU implementation of EGSnrc (GEGS) and some basic benchmarking against EGSnrc. Then a framework for multi-leaf-collimator (MLC) simulation designed for GPU will be introduced. This new framework is designed to minimize the code divergence in GPU. It also allows the simulation of MLCs of arbitrary shapes, which makes it possible to be adopted for MLC from different manufacturers. Some examples of simulated MLC fields will be presented.

OMPI Seminar: Richard Wassenaar and Alexandra Bourgouin

Date: Thursday, March 21, 2019
Time: 3:30 - 5:00 pm, Refreshments start at 3:15 pm.
Location: Health Canada, Radiation Protection Building, 775 Brookfield Road, Room 205B

Prof. John Kildea
Opal - Empowered Patients, Informed Research
McGill University

Presentations:

1) Determination of W(air) in high-energy electron beams

by Alexandra Bourgouin, PhD Candidate, Carleton University, Department of Physics

Supervisor: Malcolm McEwan

Abstract: The mean energy required to create ion pair in air, W(air), is considered to be energy independent above 10 keV. However, an extreme interpretation of the available data would allow a variation of up to 2% in the clinical energy range. To investigate this, a graphite ionization chamber and calorimeter with the same geometry and sensitive volume were irradiated with high energy electron beams to yield a value for W(air). Although the experiment yielded a value consistent with the ICRU #90 value, it highlighted the problems of using graphite detectors, particularly related to density variations. To obtain additional experimental data in high-energy electron beams to determine W(air), a pure aluminium detector has been designed, built and is now being commissioned.

2) Development of Occupational Dosimetry Metrics for a Source Manufacturer

by Richard Wassenaar, PhD, Nordion (Canada)

Abstract: Nordion is a manufacturer and world-wide distributor of radioisotope sources. Open sources of radioisotopes are received from various reactors. The radioisotopes are processed and manufactured into sources destined for health care facilities and industrial irradiators. Given the high-activity, high-radiation risk nature of the work, Nordion has implemented a robust occupational radiation dosimetry program for its workers. In this talk, I will present some of the work Nordion is doing to further develop metrics for dosimetry analysis to improve evaluation of personnel doses. I will discuss the analysis of data undertaken as a result of the recent revision regarding the lens of the eye doses and present an interesting case study that was found during the analysis. In addition, I will present my work relating to automated statistical analysis of personnel's dosimetry measurements.

OMPI Seminar: Dan LaRussa and Christopher Dydula

Date: Thursday, April 18, 2019
Time: 3:45- 5:15 pm, Refreshments start at 3:30 pm. Please notice the 15 minute delay in start.
Location: The Ottawa Hospital, 501 Smyth Road., Auditorium (Room M2919, 2nd floor)

Presentations:

1) "Fast synchrotron-based x-ray scatter projection imaging: Image acquisition, formation, and quality assessment"

by Christopher Dydula, PhD Candidate, Carleton University, Department of Physics

Supervisor: Paul Johns

Abstract: X-ray scatter imaging utilizes material-dependent scatter signatures to provide information missed by conventional transmission imaging and improve contrast. It has applications in medicine, security, and non-destructive testing. One challenge to its dissemination has been the time needed to acquire image data. We have implemented a prototype x-ray scatter projection imaging system at the Canadian Light Source synchrotron, and have reduced acquisition times from ~1 h to ~2 min. In this talk I will present scatter data acquisition schemes, the steps required to turn the data into images, and assess image quality degradation in the faster compared to the slower schemes.

2) "Advanced visualization of medical images and models using virtual reality"

by Daniel LaRussa, PhD, The Ottawa Hospital

Abstract: A new era of virtual and augmented reality technology is enabling a new, booming landscape of innovative medical applications. In this presentation, a comprehensive framework for navigating this new creative space will be introduced, with an emphasis placed on visualizing and manipulating medical images and models in a perspective 3D environment. Various concepts associated with this framework will be illustrated using examples of medical virtual reality applications under development by realizeLAB at The Ottawa Hospital (TOH) and University of Ottawa. New opportunities for personalized care, cross-discipline clinical collaboration and communication, and integration with radiology and radiotherapy programs will also be highlighted

OMPI Seminar: Eric Christiansen and Trevor Stocki and Year End BBQ

Date: Thursday, May 23, 2019
Time: 3:30 - 5:00 pm, Refreshments start at 3:15 pm. BBQ to follow (see below).
Location: National Research Council, 1200 Montreal Road (at Blair Road), Kelvin Room (M36)

Presentations:

1) 4D-VMAT plan optimization: Robustness against variations in breathing pattern
Eric Christiansen, Carleton University, Department of Physics

Supervisors: Emily Heath & Tong Xu

Abstract: Volumetric modulated arc therapy (VMAT) is a radiation therapy technique that can deliver dose distributions which conform tightly around the tumour, and as such have become a standard radiotherapy treatment for many cancer sites. To accomplish this high degree of conformity, a multi-leaf collimator (MLC) inside the treatment machine is used to modulate the intensity of the radiation beam while it is rotated around the patient. Internal organ motion during radiotherapy, such as the movement of the lungs due to breathing, can distort these highly conformal treatments, leading to a blurred dose distribution. This deviation from the planned dose may result in an increased dose to healthy tissues and/or a decreased dose to the tumour, thereby compromising treatment outcomes. A variety of approaches have been developed to address tumour motion during radiation therapy, but the ideal solution would be to adapt the radiation beam delivery in real-time to follow the tumour motion. PeTrack is a tracking system developed at Carleton University that can accurately measure tumour motion using positron-emitting markers implanted directly into the tumour. A 4D-VMAT treatment optimization algorithm will be presented, which coupled with PeTrack or other real-time tracking system, could be used to deliver a conformal therapy to mobile tumours. In contrast to some 4D-VMAT approaches, dose is computed along all specific tumour trajectories. Further, the algorithm uses a patient-specific probabilistic model of the breathing pattern to compute the expectation value and variance of the dose integrated over all possible trajectories. The optimization is based on a combination of a quadratic objective function and a variance term, which is included so that the final plan is robust to changes in the expected patient breathing pattern.

2) “Radioecology of Small Modular Reactors (SMRs): Can sunken subs help us?”
Trevor Stocki, Health Canada

Abstract: A number of countries are doing research into developing Small Modular nuclear Reactors (SMR) for electrical power generation. These types of reactors could be used to power remote locations, heavy industry applications, and on-grid applications. This nothing new, from 1968 to 1975, the Americans used a “SMR” in the Panama Canal Zone for electricity. This was a floating nuclear power station, named the MH-1A. More recently the Russians have put two nuclear reactors on a barge and plan to send it to a remote Arctic community to replace diesel power generation. Canada also has a road map for SMRs. Health Canada is required to review environmental assessments, so Health Canada is interested in the radio-ecological consequences of SMRs in terms of radiation dose received by humans. A possible first step in understanding SMRs is to understand the radioecology of the nuclear submarines that have been sunk in the Kara Sea and surrounding area. The question posed is can this help shine any light on the issue for SMRs? The submarine, K-27 will be discussed.

BBQ:

If you haven’t already done so, please RSVP to OMPI year-end BBQ using the following link: https://forms.gle/XHwvyahHVo8f9FyE7

The team at NRC will be shopping to order based on RSVPs, so please confirm your attendance and meal preference as soon as possible to avoid missing out on the fun!

Special lecture: Broadband Photon Tomography

Date: Wednesday, June 19, 2019
Time: 11:00-12:00
Location: University of Ottawa Heart Institute, 40 Ruskin St., Centre Foustenellas Auditorium

Title: Broadband Photon Tomography: High Performance Integrated 4x4D PET, SPECT, Optical & X ray Tomography

Presenter: Prof. dr. Freek J. Beekman, Delft University of Technology, Department of Radiation Science and Technology

Abstract: In this presentation a highly adaptive and versatile nuclear, optical and structural imaging platform will be explained along with many scientific applications contributed by hundreds of world wide users. Finally, the results of translating our nuclear imaging technologies into <3 mm resolution clinical SPECT will be presented.

Special Event: The Elements (part of OMPI30)

Date: Thursday, September 19, 2019
Time: 15:30-17:00, Refreshments start at 3:15
Location: Carleton University, Herzberg Laboratories, Room 4351

Program:

1) Lecture: The Periodic Table: How the elements are discovered and named.

By: Juris Meija (NRC)

Abstract: The Periodic Table of Chemical elements has been called one of the greatest icons of our culture. At 150 years old, it still continues to inspire artists, adorns virtually every science class in the world (even Bill Gates has one in his office), and leaves still enough room for scientists to explore the properties of super-heavy elements. Is there a single definite Periodic Table or does it matter? What can it predict, how did we get to the 118 elements we know today, and who gets to name the elements?

2) Activity: What is the best/most important element for Medical Physics?

By: Malcom McEwen and attendees

OMPI members will make a bid to have their element recognized as the most significant to Medical Physics.

Abstract: The current periodic table contains 118 elements and it can be argued that medical physics makes use of most of them (at least up to Z=98). However, there are clearly certain elements that are more important and more associated with medical physics than others. In this presentation we will be reviewing the periodic table and identifying the important elements/isotopes that have aided the development of medical physics and are at the forefront of diagnosis and treatment of disease (Note we are not talking about “basic infrastructure” elements such as Fe, Al or Si or “essential-for-life” elements such as C, O and H).

As an added twist, this is not a one-way presentation, attendees are invited to make their case for their favourite element. The format is 2 minutes, with an option of a single Powerpoint slide. (Warning to the verbose - these constraints will be rigidly imposed!) It’s first-come, first-served, so don’t wait for the day of the seminar to propose your element, duplicates will not be allowed. Once we’ve completed this exhaustive review the audience will vote to determine THE medical physics element! There will be a prize for the winning presenter as well!

3) Event is followed by social gathering at Mike’s Pub including a quiz.

Special Event: The Elements (part of OMPI30)Special Event: The Great (Medical Physics) Debate (part of OMPI30)

Date: Thursday, October 17, 2019
Time: 16:00-17:00
Location: University of Ottawa Heart Institute, 40 Ruskin St., Centre Foustenellas Auditorium (Room 2367)

Program:

This is the second of three special, monthly events being held in September, October, and November of this season as we celebrate 30 years of OMPI - regular seminar schedule will resume on 28 November 2019.

Two teams will debate a subject in medical physics to be chosen by the membership. The audience will vote for the winners by applause. Debate Resolution:

<table>
<tr><td colspan="2">Debate Resolution:

The increased use of Artificial Intelligence (AI) and Machine Learning (ML) in medical science poses undue risk to patient outcomes.</td></tr>
<tr><td>Debaters in favour of resolution:

David Wilkins - Experienced Medical Physicist, Boat maker, and now happily retired.

Nathan Murtha - PhD graduate student, Medical Physics, Carleton University</td><td>Debaters opposed to resolution:

Graeme Wardlaw - Medical Physicist, Health Canada Iymad Mansour - PhD graduate student, Medical Physics, Carleton University</td></tr>
<tr><td colspan="2">Moderator:

Malcolm McEwan - National Research Council (NRC)</td></tr>
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For more information on special events, please visit OMPI30 webpage:
https://science.carleton.ca/ompi30/

Special Event: Symposium and Dinner celebrating OMPI30

Date: Thursday, November 7, 2019
Time: 13:00-21:00
Location: Carleton university, Residence Commons 270/272/274 followed by Baker's Grill

Program:

The focal event of OMPI30 celebrates 30 Years of Collaboration and Innovation in Medical Physics through half-day symposium and celebratory dinner.

Program at a glance:

Time	Activity	Location
13:00	Poster viewing and networking	Residence Commons
13:30	Opening remarks	Residence Commons
14:00	Presentatiaons and panel discussion	Residence Commons
17:00	Reception and dinner at Baker's Grill (by registration)	Baker's Grill

For full information, please visit https://science.carleton.ca/cu-events/ompi30-symposium/ and...

Don't forget to register here

OMPI Seminar: Ming Liu and Sangeeta Murugkar

Date: Thursday, November 28, 2019
Time: 15:30, refreshements 15:15
Location: Health Canada, Radiation Protection Building, 775 Brookfield Road, Room 205B

Presentations:

1) Patient-specific PTV margins for liver SBRT with an early-warning system for margin adaptation

by Ming Liu (PhD Candidate)

Supervisors: Joanna Cygler and Eric Vandervoort

Abstract: In radiation therapy, the planning target volume (PTV) covers the gross tumor volume (GTV), and the PTV-GTV margin compensates for the tumor motion as well as some other uncertainties during treatment. We aim to reduce the PTV margin to avoid high dose in healthy tissue surrounding the tumor. Therefore, we propose an adaptive PTV margin strategy incorporating a volumetric tracking error assessment after each fraction of robotic stereotactic body radiation therapy (SBRT) liver treatment. Based on a mock treatment before planning, support vector classification (SVC) is used in the classification of different translational motion-tracking residual errors for patients. We are developing tools based on both volumetric and dosimetric assessments for liver treatments using CyberKnife, to implement patient specific PTV margins prior to planning.

2) Developing optical techniques to measure treatment response

by Sangeeta Murugkar, PhD (Carleton University)

Abstract: Raman spectroscopy is a non-invasive, label-free optical technique that is based on the inelastic scattering of light by vibrating molecules. We have successfully applied this single-point measurement technique, in conjunction with multivariate statistical analysis methods for the label-free classification of living cells and tissue based on their chemical composition. This talk will describe our recent work to develop a Raman spectroscopy-based technique to measure the response of blood undergoing oxidative stress. In addition, it will include a discussion of our new, lab-built multimodal nonlinear optical microscope that is expected to shed light on fundamental mechanisms of cellular response. We are using this label-free imaging platform to quantify changes in the metabolic activity of live blood cells exposed to different external stimuli.