CIII-AT-0042
Image Processing, Information Engineering &
Interdisciplinary Knowledge Exchange

I Abstract

Operative for more than twenty years now, AT - 42 is an interdisciplinary network focused on cooperation between medical and engineering departments. Image Processing is a highly interdisciplinary field. High level engineering skills are essential as modern imaging heavily relies on Artificial Intelligence. In terms of Pediatric Imaging, procedures and interpretation are even more challenging.
From 3 partners back in 1997, AT - 42 has grown each year and now comprises 54 departments. Size matters: Due to the complexity of the subjects dealt with, the special experience of each partner is a valuable input for the whole network. On the other hand, best practice examples are thus more easily disseminated.

Special requirements of Pediatric Imaging

Children are not simply “small adults”! They differ from adults, both in body proportion and composition, which in turn change according to age. Their bones are still **growing** and thus show epiphyses, which should not be misinterpreted as fractures.
Radiation protection is key as **children are still growing** and thus more of their cells are in the sensitive division phase. Children younger than 10 years of age carry a 3 - 4 times higher risk of incurring DNA damage and developing leukemia or solid tumors than adults at the age of 30 - 40.
Last but not least **psychological aspects** need to be considered. Infants and young children react instinctively to unknown and scary situations and are strongly influenced by the emotional reaction of their caregiver. Their patience is limited. It is therefore essential to work swiftly and smoothly as not to overtax the patients´ endurance.

II Aspects of practical implementation

1) **Semester exchange actions:**

   AT - 42 exchanges both students and teachers. Special attention is given to thesis supervision in order to promote young scientists. Several of our PhD students have achieved the rank of professors by now, e.g. Assoc. Prof. Dr. Jovan Lovrenski of Novi Sad, who will serve as president of the ESPR (= European Society of Pediatric Radiology) Congress in Belgrade 2023, - the first time this congress will take place in a non - EU country.

Current research topics and theses topics:

- Knowledge Exchange in the field of Pediatric Radiology and Radiation Protection
- 3D Printing and Nuclear Medicine
- Lung Ultrasound in Premature Babies and Neonates
- Detection of DNA Double Strain Breaks (DDSB) after imaging procedures

2) **Know how dissemination - Summer Schools:**

Each year four schools and workshops and one academy are organized.
This educational concept is very valuable, providing in depth knowledge transfer as partners can share their experience. Lecturers and participants then act as multiplicators at their home institution.

"School of Pediatric Hematology" - prepared and organized by the
Division of Pediatric Hematology/Oncology, Dep. of Pediatrics and Adolescent Medicine, Medical University Graz:

- Due to know how taught at this Summer School, the survival rate of children in Kosovo* suffering from Leukemia could be raised from 30% to 70%.

"CEEPUS Summer Academy of Pediatric Medicine" - prepared and organized by the Division of Pediatric Radiology, Dep. Of Radiology, Medical University Graz. Due to the pandemic cancelled in 2020 but to be held in 2021 in a hybrid setting, both face to face and online.

- First organized in 2014, this academy is usually attended by 30 – 40 students from over 20 countries, including Australia and Canada.
- Subjects taught include Pediatrics, Pediatric Surgery, Plastic Surgery and Pediatric Radiology and Blood Transfusion Medicine.
- **Innovative teaching methods:** Interactive lessons focusing on topics which are hard to find in textbooks or difficult to comprehend as well as hot research topics.

"Summer School on Image Processing (SSIP)" - prepared by the Dep. of Informatics, University of Szeged, organized by rotating partners.

- Already organized 27 times, in 2019 by the Dep. of Computer Science, West University of Timisoara. In 2020 organized online, in 2021 by the Faculty of Engineering, University of Rijeka.
- **Teaching Method:** Lectures in the morning, project work in the afternoon.

  Lectures cover all aspects of Image Acquisition,
  Image Reconstruction, Image Processing as well as related topics of Natural Science.
  For the **project work** academic supervisors prepare up to 20 projects covering a wide range of image applications. Students can select their favorite topics and are then divided into groups of 4 persons, which use one of the three languages defined in the CEEPUS III Work Program, Action 1, para 2c (English, German, French).
  Academic teachers supervise the project work and support students, teamwork is encouraged.
  At the end of the SSIP students have to pass a **written test,** they have to **present their project work orally in English**, and **create a web page.**
  Practical results: Software developed as a student project at the SSIP 2004 is now used for research in Dermatology (classification of digital laser microscopic images).
- **Organizer in 2021:** Department of Computer Engineering, Faculty of Engineering, University of Rijeka.

"CT School" - prepared and organized by the Clinical Center Novi Sad.

- Provides high level medical education within the CEEPUS region since 2003, since 2007 in cooperation with CEEPUS.
- Medical partners of the CEEPUS network delegate students as well as academic Teachers.

In the pipeline:

- Imaging in Dental Medicine
- Winter School on Environmental Pollution in Tirana

3) **Publications, Prizes and Cooperation:**

- AT – 42 has published **more than 200 papers** so far and has **won several international prizes** and **awards.**
- On behalf of the ESPR the course "**Pediatric Essentials**" was organized with Romanian CEEPUS Partners (Cluj-Napoca, Bucharest, Brasov).
- **Pediatric radiologists of several West Balkan hospitals** have been **trained in Graz** and are **being supported** in techniques to lower radiation exposure.
- AT – 42, Dept. of Radiology, Medical University Graz, has been awarded **two WTZ projects by the OeAD**, with Montenegro and North Macedonia, resp. Topics were the comparison of legal requirements in AT and ME in respect to Radiation Protection and the detection of DNA Double Strain Breaks after imaging.
- A **K 107/Erasmus+ project** funding cooperation between the Dept. of Radiology, Medical University Graz and medical doctors and engineers from the Medical University of Tirana and the Canadian Institute of Technology, Tirana.
  Topics are **microprocessor controlled high-precise chest tomographies of oncological patients for standardized follow up investigations** and finding a way to **help lessen anxiety** of our young patients waiting for imaging procedures:
  Designing a toolbox for 3D printing of medical imaging devices: Imaging devices can be very daunting for children. But what if you have a Lego – like toolbox to play with while you wait and you can actually build a device? This way children get to know the equipment playfully and spend their waiting time in a much more relaxed manner.
- Longstanding cooperation with **industrial partners ("Silent Partners")** and with the **Bulgarian National Centre of Radiobiology and Radiation Protection (NCRRP).**