Janus Sistema Administrativo da Pós-Graduação

Discipline Information

The following dates are in (dd/mm/yyyy) format.

Code: RAL5882 - 3 Type: POS
Name: State of the Art of Medical Image Processing: Applications in Research on the Musculoskeletal System
Concentration area: Ciências da Saúde Aplicadas ao Aparelho Locomotor (17142)

Approval dates:

CCP: 03/08/2023 CPG: 03/10/2023 CoPGr:

Activation date: 03/10/2023 Inactivation date:

Workload:

Total: 60 h Theory: 8 h Practice: 4 h Study: 3 h

Credits: 4 Duration: 4 weeks

Professors:
1513550 - Paulo Mazzoncini de Azevedo Marques - 03/10/2023 until today
1606369 - Marcello Henrique Nogueira Barbosa - 03/10/2023 until today
2308521 - Rangaraj Mandayam Rangayan - 03/10/2023 until today

Objectives:

The aim of the discipline is to introduce graduate students and researchers in medical imaging processing, addressing aspects related to current scientific production (state of the art), and an introduction to applications in the locomotor system.

Rationale:

Medical images are no longer considered only a qualitative evaluation. Medical images provide quantitative information related to disease severity, with potential definition of prognostic biomarkers of disease and of response to treatment. Therefore, computerized diagnostic aided systems have been developed to support medical imaging diagnosis and therapeutic decision. With the development of artificial intelligence, big data and machine learning, there is a strong expansion in the use of these tools in clinical and basic research in the medical field.

Content:

Basic concepts of image processing (pre-processing, image segmentation, attribute extraction and classification). Medical image computer aided diagnosis

Bibliography:

Digital Image Processing. Gonzalez R.C., Woods R.E. Addison-Wesley, 2017. ISBN-13 978-9811061127.
Biomedical Image Analysis. Rangaraj M Rangayyan. CRC Press, 2005. ISBN-13 978-0849396953.
Paulo M Azevedo-Marques, Arianna Mencattini, Marcello Salmeri, Rangaraj M Rangayyan, Medical Image Analysis and Informatics, Computer-Aided Diagnosis and Therapy, CRC Press 2018, ISBN 978-1-4987-5319-7.
Zheng Que, Lu Z, Feng Que, Ma J, Yang W, Chen C, Chen W. Adaptive Segmentation of Vertebral Bodies from Sagittal MR Images Based on Local Spatial Information and Gaussian Weighted Chi-Square Distance. J Digit Imaging 2013; 26:578–593.
Al-Helo S, Alomari RS, Ghosh S, Chaudhary V, Dhillon G, Al-Zoubi MB, Hiary H, Hamtini TM.

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Discipline Information

Compression fracture diagnosis in lumbar: a clinical CAD system. Int J CARS 2013; 8:461–469.
Satoshi Kasai,a_ Feng Li, Junji Shiraishi, Qiang Li, and Kunio Doi. Computerized detection of vertebral compression fractures on lateral chest radiographs: Preliminary results with a tool for early detection of osteoporosis. Med Phys. 2006;33:4664-74.
Wang KC, Jeanmenne A, Weber GM, Thawait S, Carrino JA. An Online Evidence-Based Decision Support System for Distinguishing Benign from Malignant Vertebral Compression Fractures by Magnetic Resonance Imaging Feature Analysis. Journal of Digital Imaging, 2011; 24: 507-515.
Tan S, Yao J, Yao L, Ward MM. High precision semiautomated computed tomography measurement of lumbar disk and vertebral heights. Med Phys 2013; 40(1):011905.
Dionísio F.C.F., Oliveira L.S., Hernandes M.A., Engel E.E., Rangayyan R.M.; AzevedoMarques P.M, Nogueira-Barbosa M.H. Manual and semiautomatic segmentation of bone sarcomas on MRI have high similarity. Brazilian Journal of Medical and Biological Research (on line) v. 53, p. e8962, 2020.
Faleiros MC, Nogueira-Barbosa MH; Dalto VF; Júnior, Ferreira Junior JR, Tenório, APM, Luppino-Assad R, Louzada-Junior P; Rangayyan RM; de Azevedo-Marques PM. Machine learning techniques for computer-aided classification of active inflammatory sacroiliitis in magnetic resonance imaging. Advances in Rheumatology, v. 60, p. 1-10, 2020.
Tenório APM, Faleiros MC, Ferreira Junior JR, Dalto VF, Assad RL, Louzada-Junior P, Yoshida H, Nogueira-Barbosa MH, Azevedo-Marques PM. A study of MRI-based radiomics biomarkers for sacroiliitis and spondyloarthritis. International. Journal of Computer Assisted Radiology and Surgery, v. 15, p. 1737-1748, 2020.
Maciel JG, Araújo IM, Trazzi LC, de Azevedo-Marques PM, Salmon CEG, Paula FJA, Nogueira-Barbosa MH. Association of bone mineral density with bone texture attributes extracted using routine magnetic resonance imaging. Clinics v. 75, p. e1766, 2020.
Santos MK, Júnior, Ferreira Junior JR; Wada DT, Tenório APM, Nogueira-Barbosa MH, de Azevedo-Marques PM. Artificial intelligence, machine learning, computer-aided diagnosis, and radiomics: advances in imaging towards to precision medicine. Radiologia Brasileira, v. 1, p. 1-10, 2019.

Type of Assessment:

To complete the participation in the discipline the student must choose one of the themes presented in the seminars or activities to write a report.

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