

# **BRACCO FELLOWSHIPS EDUCATION IN RESEARCH ENROLMENT FORM**

**Name of Institution:**

Department of Radiology and Imaging guided Therapy, Medical University Vienna.

**City and Country of Institution:** Vienna, Austria

## **RESEARCH GROUP**

Placental dysfunction is the most common cause of intrauterine growth restriction (IUGR) and preeclampsia. Screening and diagnosis of these disorders currently relies on indirect measures to the placenta of via blood flow pulsatility in the uterine or umbilical arteries with Doppler ultrasound. There is a lack of non-invasive tools to examine and monitor placental function in vivo. Short and medium terms complications include perinatal mortality and morbidity, the need for intensive neonatal care, poor cognitive and neurologic development such as attention, creativity, language, memory, performance, and learning abilities as well as long term complications in adults who were IUGR are more prone to cardiovascular disease, hypertension, and diabetes.

Our aim is to apply radiomic analysis on the fetal placenta to improve tissue characterization on this highly complex organ, and to improve the accuracy of outcome prediction in cases with IUGR, to better evaluate the underlying disease aspects of placenta insufficiency in relation to the fetal brain growth. Radiomics describes an image analysis process, where large number of quantitative features are extracted from MR image data of the fetal brain and placenta, via predefined statistical operations (1). The aim of radiomics is to identify visually imperceptible image features of the that characterize a specific tissue and predict a certain outcome, thus maximizing potentially useful information from current medical images (2). This important new concept has thus far primarily been applied to oncologic imaging to improve patient outcome prediction, however recently it is increasingly been applied in non-oncologic imaging, including in-vivo fetal imaging of the developing brain organs (3-5). Fetal MRI is a superb imaging tool for the evaluation of fetal organs and placenta during the crucial time of development. By applying both conventional and functional MR sequences such as T2-weighted and diffusion-weighted sequences respectively it provides better insights into the fetal microstructural developing organs and extracting the relevant imaging features for radiomic analysis (6). Thus, combining both visual and quantitative radiomics-based assessment of the placenta has the potential to advance fetal MRI by increasing the amount of relevant information that can be extracted from the routinely acquired image data.

1. Gillies RJ, Kinahan PE, Hricak H. Radiomics: images are more than pictures, they are data. *Radiology*.
2. Lambin P, Leijenaar RTH, Deist TM, et al. Radiomics: the bridge between medical imaging and personalized medicine. *Nat Rev Clin Oncol*. 2017

3. Bae S, Choi YS, Ahn SS, et al. Radiomic MRI phenotyping of glioblastoma: improving survival prediction. *Radiology*. 2018
4. Coroller TP, Agrawal V, Huynh E, et al. Radiomic-based pathological response prediction from primary tumors and lymph nodes in NSCLC. *J Thorac Oncol*. 2017
5. Du Y, Fang Z, Jiao J, et al. Application of ultrasound-based radiomics technology in fetal-lung-texture analysis in pregnancies complicated by gestational diabetes and/or pre-eclampsia. *Ultrasound Obstet Gynecol*. 2021]
6. Balassy C, Kasprian G, Brugger PC, et al. MRI investigation of normal fetal lung maturation using signal intensities on different imaging sequences. *Eur Radiol*. 2007

### **TITLE OF PROPOSED RESEARCH PROJECT**

Hacking placental dysfunction in IUGR via radiomics analysis.

### **OBJECTIVES**

My aim is to apply radiomic analysis on the fetal placenta to improve tissue characterization on this highly complex organ, and to improve the accuracy of outcome prediction in cases with IUGR.

### **APPLICANT'S DUTIES**

- Acquire, collect and manage all relevant data for the research. Collaborate with other medical staff members.
- Developing new skills in pre and postimage processing.
- Writing articles, and to prepare oral/written presentations for national and international conferences.

### **APPLICANT'S BENEFITS**

- Acquiring new valuable skills in research. Participation on scientific outcomes of the project i.e. presentations to congresses and publications of papers.
- Project Leader: Prof. Gregor Kasprian, Professor of Radiology, Department of
- Radiology and Imaging guided Therapy, Medical
- University Vienna