

# Thick Data Analytics for Detecting Inflammatory Bowel Diseases (IBD) Based on Vision Transformers

MSc Project 2024/2025

Supervised by Professor Jinan Fiaidhi and Professor Sabah Mohammed

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## Research Questions to be answered:

- (1) How vision transformers and spatial transformers can be used for early identification of IBDs (e.g. Ulcerative Colitis, Crohn Disease)?
- (2) How different they are from the classic neural network approaches?
- (3) What are the best transformers and spatial transformers models for detecting IBDs?
- (4) How can I improve the work of vision transformers using thick data approaches:
  - a. What if I employed Siamese Neural Networks for one-shot or multi-shots learning?
  - b. What if I used kind of YOLO approaches to zoom into region of interests?
  - c. What if I used adaptive transformers?
  - d. What if I used fine tuning techniques on top of the adaptive transformers?
- (5) Comparison and Analytics

## Requirements:

1. Creating a public Github of the MSc Project and share it with supervisors (5%)
2. Weekly updates including programming and surveying using emails + on Github (60%)
3. Proposal Presentation for Supervisors during mid January 2025. (5%)
4. Public Presentation March 31, 2025 (5%)
5. Journal/Conference Paper during May 1, 2025 (25%)

## Primary Datasets:

1. <https://datasets.simula.no/kvasir/>
2. <https://osf.io/mh9sj/>
3. <https://datasets.simula.no/kvasir-capsule/>

## Background Research Papers:

1. Fiaidhi, Jinan, Sabah Mohammed, and Petros Zazos. "Investigation into the Categorization of Crohn's Segments from Capsule Endoscopy Videos:: Introducing A Thick Data Categorization Framework." In 2023 3rd International Conference on Innovative Research in Applied Science, Engineering and Technology (IRASET), pp. 1-6. IEEE, 2023.
2. Fiaidhi, Jinan, Sabah Mohammed, and Petros Zazos. "Siamese Neural Network for Labeling Severity of Ulcerative Colitis Video Colonoscopy: A Thick Data Approach." In Proceedings of SAI Intelligent Systems Conference, pp. 124-135. Cham: Springer International Publishing, 2022.
3. Fiaidhi, Jinan, Sabah Mohammed, and Petros Zazos. "Thick Data Techniques for Identifying Abnormality in Video Frames for Wireless Capsule Endoscopy." In 2022 IEEE International Conference on Big Data (Big Data), pp. 5263-5268. IEEE, 2022.
4. Fiaidhi, Jinan, Sabah Mohammed, and Petros Zazos. "An Investigation into Crohn's Disease Lesions Variability Sensing Using Video Colonoscopy and Machine Learning Techniques." In 2022 IEEE International Conference on E-health Networking, Application & Services (HealthCom), pp. 37-42. IEEE, 2022.
5. Mohammed, Sabah, Jinan Fiaidhi, and Hashmath Shaik. "Empowering Transformers for Evidence-Based Medicine." medRxiv (2023): 2023-12.
6. Ayana, Gelan, Hika Barki, and Se-woon Choe. "Pathological Insights: Enhanced Vision Transformers for the Early Detection of Colorectal Cancer." Cancers 16, no. 7 (2024): 1441.
7. Meng, Lingchen, Hengduo Li, Bor-Chun Chen, Shiyi Lan, Zuxuan Wu, Yu-Gang Jiang, and Ser-Nam Lim. "Adavit: Adaptive vision transformers for efficient image recognition." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pp. 12309-12318. 2022.
8. He, Qiuchen, Shaobo Li, Qiang Bai, Ansi Zhang, Jing Yang, and Mingming Shen. "A Siamese Vision Transformer for bearings fault diagnosis." Micromachines 13, no. 10 (2022): 1656.