

# Thesis

Title of project / Thesis	Differentiation of bone marrow cell morphologies using deep neural networks.
Topic / Key words	Medical image analysis, deep learning, unsupervised learning, generative adversarial network
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External partners	Universitätsspital Zürich
Place(s) of work	Wädenswil
Abstract	<p>The classification of bone marrow (BM) cell cytomorphology, an important corner stone of hematological diagnosis, is still done manually thousands of times every day.</p> <p>Deep convolutional neural networks (CNNs) provide state-of-the-art performance for the classification problem of single BM cells [1].</p> <p>The project aims to enhance the state-of-the-art of BM cell classification based on a large data set of 171,374 microscopic cytological images taken from BM smears from 945 patients diagnosed with a variety of hematological diseases. The work focuses on a data-centric approach, i.e., rather improve the data-side than experimenting with a variety of model/network architectures.</p> <p>Different image augmentation techniques shall be implemented and tested. Amongst other, the generation of “new” images using generative models based on the existing database.</p>
Requirements	<ul style="list-style-type: none"> <li>- Basic knowledge and willingness to learn the usage of deep learning frameworks such as pytorch, tensorflow etc.</li> <li>- Fundamental machine learning knowledge</li> <li>- Basic knowledge in computer vision / image analysis</li> <li>- Basic knowledge and willingness to learn the usage of unix-based systems and the command line</li> </ul>
Comments	<p>[1] Matek, C. et al. (2021). Highly accurate differentiation of bone marrow cell morphologies using deep neural networks on a large image data set. <i>Blood</i>, 138(20), 1917–1927.  <a href="https://doi.org/10.1182/blood.2020010568">https://doi.org/10.1182/blood.2020010568</a></p>
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