towards the kynurenine pathway via elevated indoleamine 2,3-dioxygenase (IDO) activity is increased in bipolar disorder. Factors such as age, sex, weight, psychiatric symptoms and the response to psychopharmaceutical treatment in particular to lithium [1] might be involved in the tryptophan degradation towards the kynurenine axis.

Methods: Peripheral tryptophan and kynurenine levels were assessed to investigate 1.) the kynurenine/tryptophan ratio as a proxy for IDO activity of 226 individuals with bipolar disorder in comparison to 142 controls stratified by normal-/overweight, 2.) the IDO activity in association to the clinical state and depressive/manic episodes in a longitudinal setting in 75 individuals with bipolar disorder and 3.) the association of IDO levels with the response to lithium rated with the Retrospective Criteria of Long-Term Treatment Response in Research Subjects with Bipolar Disorder (Alda scale). A MANCOVA with age and sex as covariates were conducted to test for differences in levels of kynurenine to tryptophan ratio between participants with bipolar disorder and controls as well as between normal- and overweights. Repeated measures ANCOVAs for the ratio at three different time points were conducted for (a.) euthymic over all time points versus not and (b.) illness episode between t1 and t3 versus no episode. To investigate the difference between lithium responders and non-responders unpaired t-tests will be used. Pearson and Spearman correlations will test the association of the kynurenine/tryptophan ratio and the Alda score.

Results: So far, higher kynurenine/tryptophan ratio as a proxy for IDO activity in individuals with BD compared to controls as well as higher levels in overweight compared to normal weight persons were presented. Levels remained stable over the longitudinal course with showing no differences between individuals who had an illness episode or not [2]. The findings of the associations with kynurenine/tryptophan ratio and the lithium response will be shown at the congress.

Conclusion: The findings support former research that IDO activity may play a role in the pathophysiology of bipolar disorder. The elevated catabolism of tryptophan to kynurenine may lead to a reduction in the circulating tryptophan being less available for the production of serotonin and melatonin, which further might affect psychiatric symptomatology such as mood, sleep, circadian rhythm, comorbidities and drug response [3]. However, the IDO activity might not be related to clinical symptomatology and the occurrence of illness episodes. The catabolism may be influenced by being overweight, which is a frequent comorbidity in bipolar disorder. The findings of the role of lithium response might further elucidate the anti-inflammatory properties of lithium and are of clinical relevance towards the effort of a personalized selection of the mood-stabilizing treatment.

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An automated open-source system for dendritic spine tracing

A. Marishi [1,2], D. Esen-Sehir [1,2], T. Tsengenbayar [1,2], A. Reif [1], F. Freudenberg [1]. 1Goethe University Frankfurt- University Hospital, Laboratory of Translational Psychiatry- Department of Psychiatry- Psychosomatic Medicine and Psychotherapy, Frankfurt am Main, Germany; 2Institute for Cell Biology and Neuroscience- Goethe University Frankfurt- Frankfurt am Main, Faculty of Biosciences, Frankfurt am main, Germany

Background: Dendritic spine tracing is a key method in learning more about chronic brain disorders such as schizophrenia. Any qualitative or quantitative change in dendritic spine morphology informs us about the health of neurons and respectively of the organism. Manual tracing of spines has long been regarded as not consistent and gives highly variable results [1]. While there are several software packages (paid or free) that allow automatic spine tracing, they have drawbacks such as lack of modularity for different staining, not being affordable for small labs, and lack of availability of proper documentation [2].

Objective: To create an open-source modular automated spine tracing software that can handle different parts of the microscopy images and provide consistent results.

Methods: The software itself is a translucent box and includes hard-coded algorithms and machine learning-based algorithms that handle different stages of spine tracing. It follows an almost human like processing pipeline. First, it starts by segmenting the images into multiple tiles/segments. These segments are the input of a Convolutional Neural Network based classifier that labels the segments as different parts of a neuron. The classifier has the following 5 classes: clean dendrite (i.e., only one clean dendrite visible), mesh dendrites (i.e., multiple, overlapping dendrites visible), cell body, cell body & dendrite, and void. Afterwards, each type of these segments is handled by using a hard-coded algorithm and a machine learning-based algorithm, specifically the object detection-based neural networks (YOLO v3) [3]. The first iteration of our system was trained using microscopy data of sparsely labeled cultured hippocampal primary neurons of P0 mice. A total of 9 neurons were used for training. The machine learning models were evaluated by appropriate metrics such as accuracy, precision, recall, and F1-score.

Results: Currently our system already has a working pipeline for handling the clean dendrite segments. The other segment types are not readily handled by our algorithms. Altogether our limited yet rigorous testing shows a promising trend in the accuracy and precision of the spine tracing system. After implementing the various handling methods for different segments of a microscopy image, the system performs consistently and outputs reproducible spine tracing results. The machine learning based parts of the software are evaluated accordingly. The spine segment classifier has an accuracy of 44.9 % with the limited data. It is expected to improve as more data is available. Moreover, the brightness-based spine detector complemented the YOLO v3 based spine detector supported even more accurate tracing of spines.

Conclusion: Our open-source and well documented spine tracing system provides a modular and easy-to-use tool for spine tracing under different settings. As the system develops further, the trained models and weights will be available for everyone to use. Currently, different aspects of our model are under development and will be available for free use as different aspects of the software reach a certain level of robustness.**References**

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The factor structure of the Opening Minds Stigma Scale for Healthcare Providers on psychiatrists from 32 European countries

D. Ori [1,2], P. Szocsics [3], T. Molnár [4], M. Wallies [5], O. Kazakova [6], L. Bankovska-Motlova [7], S. Mörkl [8], S. Boivin [9], S. Raaj [10], I.M. Ingeholm Klinkby [11], C. Cabacos [12], A.T. Pereira [12], S. Metheiken [13], S. Kakar [14], S. Greguras [15], J. Maslak [16], N. Nechepurenko [17], K. Kotsis [18], H. Yilmaz Kafali [19], A. Mirkovic [20], P. Rus Prelog [21], K. Bruna [22], K. Guevara [23], R. Strumilla [24], M. Abdulhakim [25], E.A. Carbone [26], A. Panayi [27], I. Ivanovic [28], E. Dashi [29], G. Grech [30], M. Vircik [31], F. Schuster [32], J. Soler-Vidal [33], E. Pomarol-Clotet [33], G. Ahmadova [34], H. Kisand [35], A. Hargi [35], N. Grinko [36], S. Rózsa [37], Z. Győrffy [2]. 1Heim Pál National Pediatric Institute, Department of Mental Health, Budapest, Hungary; 2Semmelweis University, Institute of Behavioural Sciences, Budapest, Hungary; 3Semmelweis University, Department of Psychiatry and Psychotherapy, Budapest, Hungary; 4Petz Aladar County Hospital, Department of Psychiatry, Győr, Hungary; 5Psychiatric Hospital Littenheid, Psychiatric Hospital Littenheid, Sirnach, Switzerland; 6Psychiatric Clinic of Minsk City, Department of Psychiatry, Minsk, Belarus; 7Charles University, 3rd Faculty of Medicine, Prague, Czech Republic; 8Medical University of Graz, Department of Psychiatry and Psychotherapeutic Medicine, Graz, Austria; 98EPSM Étienne Gourmelen, 8EPSM Étienne Gourmelen, Quimper, France; 10Mater University Hospital, Department of Liasion Psychiatry, Dublin, Ireland; 11Aalborg University Hospital, Research Unit for Child and Adolescent Psychiatry, Aalborg,