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| **Purpose:** | | Information | |
| **Contact:** | | Simcha Jong Leiden University The Netherlands | Tel: +31 71 527 72 01 Email: [s.jong.kon.chin@liacs.leidenuniv.nl](mailto:s.jong.kon.chin@liacs.leidenuniv.nl) |
| **Contact:** | | Taghi R. Zadeh  Leiden University |  |
| **Contact:** | | Chuan Luo  Leiden University |  |
| **Contact:** | | Wessel van Eeden  Leiden University |  |
| **Contact:** | | Wessel Kraaij  Leiden University |  |
| **Contact:** | | Eric Giltay  Leiden University |  |

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| **Abstract:** | This document describes a project in the Netherlands classifying patients with depression and it includes information about a large dataset, its use cases, and benchmarking process for our AI solution. |

# Overview

The Netherlands Study of Depression and Anxiety is a longitudinal cohort study of behavioral health with two main purposes: (1) to describe the long-term course and consequences of depressive and anxiety disorders and (2) to examine (interactions of) psychological, social, biological and genetic factors of the long-term course and consequences, using an epidemiological approach.

Started from 2004, 2981 participants have been recruited in this multi-site study: 1701 persons with a current (six-month recency) diagnosis of depression and/or anxiety disorder, 907 persons with lifetime diagnoses or at risk, and 373 healthy controls. In 2016, the fifth round of follow-up measurements was conducted.

This project has four main motivations (Penninx et al., 2008): (1) “insight into long-term prognosis of depressive and anxiety disorders is limited”, (2) “when studying depression and anxiety disorders, different settings and developmental stages should be considered”, (3) "depressive and anxiety disorders should be studied in concert”, and (4) “psychosocial and biological paradigms should be integrated when examining depressive and anxiety disorders”.

# Impact

Psychiatric epidemiology has shed light on the pervasiveness of depressive and anxiety disorders and their societal footprints. However, our knowledge about the long-term course and determinants of these disorders is insufficient. Thanks to NESDA’s large sample size and elaborated assessment of the determinants and consequences of mental health, we have the opportunity to enhance our knowledge about the prognosis of the two disorders. This project not only enables us to derive better predictions and therefore more accurate and efficient planning of healthcare resources, but also contributes to better treatment of patients with depressive and anxiety disorders[[1]](#footnote-1).

# Data availability

We employed NESDA dataset, an anonymized electronic health record, for developing our model. We divided this data into two categories of training (70% of the data) and test (30% of data) with the latter being undisclosed to our model. Owners of NESDA are willing to share required data with the project of AI for Health.

Demographics, self-report, observer-rated and other health-related data at baseline of 2931 participants of NESDA are available. Clinical psychiatric diagnoses at 2, 4, 6- and 9-years follow-up can be used as outcome variables. At baseline, participants were 42.2 years old, 66.5% were women, and 53.6% had a current mood or anxiety disorder. The first wave (baseline) started in 2004 and ended in September 2007, and the 6th wave of measurement at 9-year follow-up was finished in October 2016. Demographic variables include sex, age, ethnicity, and level of education, partner status, and work status. The Composite International Diagnostic Interview (CIDI WHO version 2.1) was used to assess the presence of depressive disorders and anxiety disorders according to the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV) at each wave. Anxiety and depressive severity and symptoms at each wave were assessed with the Fear questionnaire (FQ), Beck’s Anxiety Inventory (BAI), and Inventory of depressive symptomatology – self-report (IDS-SR).

# Benchmarking

We used a machine learning technology, namely AutoML and specifically Auto-sklearn (Feurer et al., 2015) to handle the classification problem regarding depression in NESDA data. In doing so, we experimented with several scenarios, including binary classification and categorical classification, with different subsets of features, and so forth. We benchmarked our model against logistic regression and the naive Bayesian classifier on the scenarios. Concerning accuracy, the auto-sklearn model outperformed the other two models in most scenarios.

In the future, our model can be benchmarked against other machine learning technologies, for instance, Auto-WEKA and deep learning methods, for example, deep neural networks. The benchmarks can be evaluated based on accuracy, required time and computation resources.

# Organizer details

This project brings together scholars from computer science, management, and clinical practice at Leiden University. The NESDA project is a project through which researchers from the Leiden Institute of Advanced Computer Science (LIACS) and Leiden University Medical Center (LUMC) jointly work on an AI solution for handling NESDA data on depressive disorders. The call for proposals of ITU-T Focus Group on AI for Health addresses the interests of this joint work; therefore, we are interested in being shortlisted for collaborations with ITU-T Focus Group on AI for Health.

# References

Feurer, Matthias, Klein, Aaron, Eggensperger, Katharina, et al. (2015). 'Efficient and robust automated machine learning'. In *Advances in Neural Information Processing Systems*. pp. 2962–2970.

Penninx, Brenda W.J.H., Beekman, Aartjan T.F., Smit, Johannes H., et al. (2008). 'The Netherlands Study of Depression and Anxiety (NESDA): rationale, objectives and methods'. *International journal of methods in psychiatric research*, **17**(3), pp.121–140.

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1. NESDA has been a source of numerus scientific publications and dissertations. A list of the publications and dissertations is available online at

   https://www.nesda.nl/publicaties/wetenschappelijke-publicaties/

   https://www.nesda.nl/publicaties/proefschriften/ [↑](#footnote-ref-1)