

# Analisis Faktor-faktor Risiko Depresi pada Penyakit Parkinson Stadium Awal = Risk Factors Analysis of Depression in Early Stage of Parkinson's disease

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## Abstrak

Penyakit Parkinson adalah penyakit neurodegeneratif kedua yang paling umum dan menyerang sekitar 2-3% populasi di atas 65 tahun di seluruh dunia. Salah satu gejala yang sering muncul pada penderita Parkinson adalah depresi. Depresi terjadi pada sekitar 40 - 50% penderita Parkinson dan sangat umum terjadi pada tahap awal perkembangan Penyakit Parkinson. Terdapat berbagai perbedaan dalam mengidentifikasi faktor-faktor risiko depresi dalam berbagai studi yang telah dilakukan dan belum diketahui mekanisme depresi secara rinci pada Penyakit Parkinson. Oleh karena itu, akan dilakukan identifikasi faktor-faktor risiko depresi dengan metode klasifikasi, yaitu metode Decision Tree dan regresi logistik. Namun, depresi sangat umum terjadi pada Penyakit Parkinson stadium awal sehingga dapat menimbulkan masalah data yang tidak seimbang, yaitu proporsi kelas tidak depresi yang terlalu kecil dibandingkan dengan proporsi kelas depresi. Hal ini mengakibatkan model klasifikasi yang dihasilkan memiliki tingkat kepekaan yang minimum terhadap kelas minoritas. Salah satu strategi rebalancing untuk mengatasi masalah kelas data tidak seimbang adalah SMOTE (Synthetic Minority Over-sampling TEchnique). Pada tugas akhir ini, akan dilakukan analisis data mengenai depresi pada penderita Parkinson stadium awal dengan metode decision tree, dimana data tidak seimbang akan diatasi dengan metode SMOTE. Kuantifikasi risiko untuk setiap faktor teridentifikasi akan dilakukan dengan regresi logistik. Performa model diukur dari nilai precision, recall, AUC, dan F1-score . Data sejumlah 257 penderita Parkinson stadium awal pada database Parkinson's Progression Markers Initiative (PPMI) digunakan pada tugas akhir ini. Berdasarkan analisis, diperoleh secara keseluruhan faktor-faktor risiko penting yang berasosiasi dengan depresi pada penderita Parkinson stadium awal adalah kadar alpha synuclein (-syn), jenis kelamin, skor SEADL (Schwab & England – Activities on Daily Living), skor STAI-State, binding ratio putamen pada bagian kiri otak, skor RBDSQ (REM Sleep Behavior Disorder-Questionnaire), dan umur saat terdiagnosis Parkinson. Model classification tree dengan rebalancing menggunakan SMOTE memberikan nilai akurasi, precision, recall, AUC dan F1-score masing – masing sebesar 95.18%, 0.9215, 0.9412, 0.949, dan 0.9312. Peningkatan kadar alpha synuclein (-syn), perempuan, penurunan skor SEADL, penurunan skor STAI-State, penurunan binding ratio putamen pada bagian kiri otak, peningkatan skor RBDSQ, dan usia lebih tua saat terdiagnosis Parkinson secara rata-rata memiliki risiko lebih tinggi untuk terdiagnosis depresi pada Penderita Parkinson

.....Parkinson's disease is the second-most common neurodegenerative disease and affects about 2-3% of the population over 65 years worldwide. One of the symptoms that often occurs in patients with Parkinson's is depression. Depression occurs in about 40-50% of Parkinson's sufferers and is very common in early stages of the development of Parkinson's Disease. Various difference in identifying risk factors for depression in various studies that have been conducted and the mechanism of depression is not yet known in detail in Parkinson's Disease. This study identifies risk factors for depression using decision tree and logistic regression methods. However, depression is common in early-stage Parkinson's disease causing unbalanced data problems, that is the proportion of non-depressed classes is too small compared to the proportion of

depressed classes. This resulted in classification model having a minimum level of sensitivity to the minority class. One of rebalancing strategy to overcome the problem of unbalanced data classes is SMOTE (Synthetic Minority Over-sampling TEchnique). In this final project, data analysis on depression in patients with early stage Parkinson's was conducted using decision tree method, with SMOTE to handle imbalanced data. Risk quantification for each of the identified factors was carried out using logistic regression. Model performance is measured by the values of precision, recall, AUC, and F1-score. Data on 257 patients with early stage Parkinson's in the Parkinson's Progression Markers Initiative (PPMI) database were used in this final project. Based on the analysis, the overall important risk factors associated with depression in patients with early-stage Parkinson's are alpha synuclein (-syn) levels, gender, SEADL (Schwab & England - Activities on Daily Living) scores, STAI-State scores , putamen binding ratio on the left side of the brain, RBDSQ (REM Sleep Behavior Disorder-Questionnaire) score, and age at diagnosis of Parkinson's. Classification tree model with rebalancing using SMOTE produced the accuracy, precision, recall, AUC and F1-score of 95.18%, 0.9215, 0.9412, 0.949, and 0.9312, respectively. Increased levels of alpha synuclein (-syn), women, decreased SEADL scores, decreased STAI-State scores, decreased putamen binding ratio on the left side of the brain, increased RBDSQ score, and older age when diagnosed with Parkinson's on average have a higher risk for being diagnosed with depression in Parkinson's sufferers