Aminah Yuliati, 2011, Pemodelan Jumlah Penderita Demam Berdarah *Dengue* di Surabaya dengan Pendekatan Regresi Poisson Terboboti secara Geografis. Skripsi ini dibawah bimbingan Drs. Suliyanto, M.Si. dan Drs. Eko Tjahjono, M.Si., Departemen Matematika, Fakultas Sains dan Teknologi, Universitas Airlangga, Surabaya.

ABSTRAK

Model Regresi Poisson Terboboti secara Geografis (RPTG) merupakan model regresi poisson yang menghasilkan estimator parameter model yang bersifat lokal untuk setiap lokasi dimana data tersebut dikumpulkan. Model RPTG dinyatakan sebagai berikut : $y_i \sim Poisson\left[\exp\left(\sum_{k=0}^{p}\beta_k(\boldsymbol{u}_i)x_{ki}\right)\right]$; $i = 1, 2, \dots, n$ Hasil estimasi model RPTG menggunakan metode *maximum likelihood estimation* adalah : $\hat{y}_i = \exp\left(\boldsymbol{x}_i^T[\boldsymbol{X}^T\boldsymbol{W}(\boldsymbol{u}_i)\boldsymbol{A}(\boldsymbol{u}_i)\boldsymbol{X}]^{-1}\boldsymbol{X}^T\boldsymbol{W}(\boldsymbol{u}_i)\boldsymbol{A}(\boldsymbol{u}_i)\boldsymbol{z}(\boldsymbol{u}_i)\right)$

Untuk menguji kesesuaian model RPTG digunakan hipotesis H_0: $\beta_k(u_i, v_i) = \beta_k$; $k = 1,2, \dots, p$ lawan H_1: sekurang-kurangnya ada satu $\beta_k(u_i, v_i) \neq \beta_k$ digunakan statistik uji $G = -2\ln\Lambda$, dengan daerah kritis pada taraf nyata α adalah $G > \chi^2_{(\alpha\,;\,p+1)}$. Untuk menguji parameter model RPTG secara parsial digunakan hipotesis H_0 : $\beta_k(u_i, v_i) = 0$, $k = 1,2, \dots, p$ lawan H_1: $\beta_k(u_i, v_i) \neq 0$ dengan menggunakan statistik uji $t_k(\boldsymbol{u}_i) = \frac{\hat{\beta}_k(\boldsymbol{u}_i)}{\sqrt{Se[\hat{\beta}_k(\boldsymbol{u}_i)]}}$, untuk $k = 1, 2, \dots, p$ dengan daerah kritis pada taraf nyata α adalah $|\,t_k(\boldsymbol{u}_i)| > t_{\alpha/2;n-(p+1)}$.

Data yang digunakan dalam penerapan model RPTG adalah data jumlah penderita demam berdarah *dengue* sebagai variabel respon dan variabel prediktornya adalah jumlah curah hujan, jumlah sarana kesehatan, prosentase penduduk miskin, kepadatan penduduk, dan prosentase pemukiman kumuh. Hasil validasi model RPTG dengan bantuan program yang dibuat dalam *software* S-Plus 2000 menunjukkan bahwa variabel prediktor jumlah sarana kesehatan signifikan pada semua lokasi dengan nilai G = 1.67856 , *bandwidth* optimal = 0,0401 dan CV minimum = 272.322287451995. Hasil estimasi model RPTG di setiap lokasi adalah $\hat{y}_1$ = 105.94289, $\hat{y}_2$ = 94.16421, $\hat{y}_3$ = 98.04563, $\hat{y}_4$ = 100.06027, $\hat{y}_5$ = 96.14782, $\hat{y}_6$ = 142.92789, $\hat{y}_7$ = 103.27035, $\hat{y}_8$= 60.69362, $\hat{y}_9$ = 74.14952 dan $\hat{y}_{10}$ = 99.15760 dengan nilai MSE = 69.62512. Hal ini menunjukkan bahwa jumlah sarana kesehatan berpengaruh di semua lokasi dan untuk variabel-variabel prediktor yang lain hanya berpengaruh di lokasi-lokasi tertentu.

Kata Kunci : *Geographically Weighted Poisson Regression, Maximum Likelihood Estimation, Newton Raphson, Cross Validation.*

Aminah Yuliati, 2011, Modeling the Number of Patients with Dengue Hemorrhagic Fever in Surabaya with Geographically Weighted Poisson Regression approach. This thesis was supervised by Drs. Suliyanto, M.Si. and Drs. Eko Tjahjono, M.Si., Department of Mathematics, Faculty of Science and Technology, University of Airlangga, Surabaya.

ABSTRACT

Geographically Weighted Poisson Regression (GWPR) model is a poisson regression model that produces the model parameter estimator that is local to each location where data is collected. GWPR model is expressed as follows: $y_i \sim Poisson\left[\exp\left(\sum_{k=0}^{p} \beta_k(\boldsymbol{u}_i)x_{ki}\right)\right]$; $i = 1, 2, \ldots, n$.
GWPR model estimation results using the method of maximum likelihood estimation is: $\hat{y}_i = \exp\left(\boldsymbol{x}_i^T [\, \boldsymbol{X}^T \boldsymbol{W}(\boldsymbol{u}_i)\boldsymbol{A}(\boldsymbol{u}_i)\boldsymbol{X}\,]^{-1} \boldsymbol{X}^T \boldsymbol{W}(\boldsymbol{u}_i)\boldsymbol{A}(\boldsymbol{u}_i)\boldsymbol{z}(\boldsymbol{u}_i)\right)$

To test the suitability of the model used GWPR hypothesis H_0: $\beta_k(u_i, v_i) = \beta_k$; $k = 1,2, \ldots, p$ versus H_1: at least one $\beta_k(u_i, v_i) \neq \beta_k$ used the test statistic $G = -2 \ln \Lambda$, with critical areas on a real level α is $G > \chi^2_{(\alpha\,;\,p+1)}$. To test the model parameters used GWPR partial hypothesis H_0: $\beta_k(u_i, v_i) = 0$, $k = 1,2, \ldots, p$ versus H_1: $\beta_k(u_i, v_i) \neq 0$ using the test statistic $t_k(\boldsymbol{u}_i) = \frac{\hat{\beta}_k(\boldsymbol{u}_i)}{\sqrt{Se[\hat{\beta}_k(\boldsymbol{u}_i)]}}$, for $k = 1, 2, \ldots, p$ with the critical areas on the real level is $|\, t_k(\boldsymbol{u}_i)| > t_{\alpha/2;n-(p+1)}$.

The data used in the application of the model GWPR is data on the number of dengue hemorrhagic fever patients as a response variable and predictor variable is the amount of rainfall, number of health facilities, percentage of poor population, population density, and percentage of slums. GWPR model validation results with the help of a program created in S-Plus 2000 *software* demonstrated that the predictor variable significant number of health facilities at all locations with a value of G = 1.67856, the optimal *bandwidth* = 0.0401 and minimum CV = 272.322287451995. GWPR model estimation results at each location is $\hat{y}_1$ = 105.94289, $\hat{y}_2$ = 94.16421, $\hat{y}_3$ = 98.04563, $\hat{y}_4$ = 100.06027, $\hat{y}_5$ = 96.14782, $\hat{y}_6$ = 142.92789, $\hat{y}_7$ = 103.27035, $\hat{y}_8$= 60.69362, $\hat{y}_9$ = 74.14952, $\hat{y}_{10}$ = 99.15760 and the value of MSE = 69.62512. This matter indicate that the number of health facilities have affect on all location, and the another variables only affect on certain location.

Keywords: *Geographically Weighted Poisson Regression, Maximum Likelihood Estimation, Newton Raphson, Cross Validation.*