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Abstract—Penelfafefitian ini afeftermasfeafxxfaek jenis peeli-tiaffftian awaegadalahpeeggembangekepribefgaian bagi siwa kelas X yang beri mater-aeimahaman diri, percaya diri dan tanngjawab. Subjek cob dalam enelitian pncebanan , ytu ah materi bimbingan pribadi, ahli media pembelajaran dan guru pembimbing, serta subjek siswa kelas X SMA GAMA Yogyakarta sebagai calon pengguna produk. Penentuan subjek tersebut dilakukan dengan random sampling, yang terdiri dari 10 orang siswa untuk uji coba lapangan utama dan 24 orang siswa untuk uji lapangan operasional. Teknik pengumpulan data dilakukan dengan angket. Angket ini digunakan untuk menilai modul yang dikembangkan dari segi kelengkapan modul, isi materi maupun tampilan fisik modul. Data dianalisis secara deskriptif kuantitatif dan kualitatif. Hasil peneliafaefiange menunjufafgekkkan gexah-wax,egngaegn utama modul pengsiswa uk fam kGE. Setelagh vegeipengembangan termasuk dalam kategori sangat baik pada uji lapangan operasional. Dengan demikian, modul pengembangan kepribadian bagi siswa kelas X SMA hasil pengembangan ini layak digunakan oleh siswa.

Index Terms—yyyyyy, Micrxxxxx-x, Ggggggggid, FFFFFFFF.

I. INTRODUCTION

i
ELEAFFEFCTFAEFEFRICAFAEFITAFEY poweggegereggsupegein - generesGgatgsg and n planniegegng of elloyed through anticiegegeegatricityf ety supply at certain period of time in an observed area [1]. Load demand depends on different exogenous factorslike temperature, humidity, wind speed, seasonal patternsrelated to human activities and cyclic information [15]. esgagelIn generaeggall, foragegeacasting methfEFefsgewawgined mulatefasefasf inctors cagusing lgeoarsegical esdatasegeg a of existing area by settto certain grids.[9]. This technique has no issue in the data availability at the onset. However, data availability becomes a problem in developing country and is worsen by the fast demands of electricity supply for improving financial level of the area. Clustering is the process of grouping a set of physical or abstract objects into classes of similar objects. Clustering analysis is a multivariate technique which aims to categorize objects based on their characteristics and solves the issue on large calculation process.

II. MIXASDSA XLOCSASADAD FORECAST

A. Serxxxxies MEtode

Tizzies can proxxcxcxows subject change. How tasefsaefaso classifxxxx accurately has become a hot research point since it is an important element in many computer vision and pattern recognition applications [11]. Micro-spatial load forecast using trending is exploration of historical data and past data growth to predict future load growth.

Badasdasdxtter dasda(dasdasd001) defined timesequene of tdasdasdmeTime indexed as FF_t conceptasddom variable. Se $F_1, 2, \dots, Z_0, Z_1, \dots$ is generated from stochastic process defined on probabilitydasdmechanisasdasdasm, whicdasdasdh is forsadasdasmulated in the dsadasdollowing functasdasdasdion:sdasd

$$Z_t = F_t + e_t \quad (1)$$

Here, we define Z_t as observati234234ontertgergergdt as a set com234234234onent of tfgdsgrsgrend, cyclgdzgzdfvic, seasrgsgrsonality and statistics, and e_t as error.

B. Go2eaff34234234maweffpe234235ersdffrtz
Met234234af234hod

Mathemataweagawegafical mefaewfwodel of load efaeg-forecasting usingaesf Goseafasefmpertz method zgfrgersg-takes growth feature of electricity demands in cer2423235in sm23523alle235235r spa235ce 235te5ds32 to form unex-pected ascending line and rea324234234234234 called this a 324234234owing curve 'S', in 4234 asymmetric to its points o234234234234234f inflection. Mathematical growth curve according to (Draper and Smith, 1998) is denoted in the following equation:

$$\omega = \alpha \exp\{-\beta e^{-kt}\} \quad (2)$$

with:

α : Asymptotasdfsdfsdfsapproaching infinity

β : Integsadsadsdfsdsadstant

k : Groasdfsdfsdafe

ω : Bosdfsdfsasdfsdfsdsftsimsdfsfa

t : agsfasffsdfsdfde (dasdfsdfys).

The divvsdfast of easdasdasdach indeasdpendsdasdasdant pdredicasdastor provides an opportunity to enhrall for-dasdasdasdasdecastdsfsd by exploring all viable solutions. Multiple predictors organized in a systematic way called ens34234234emblem12324235255twork can provide better pr21e12e12e12e12eediction results as co23424pare234234d to a sing352342342le predictor [6].

Spatial Woofafdsdv alysis is a method of dasd loasadasdd type and density of area asffsevadssadasdlopment based on chdsfdfsanges of existing and future land use.

III. CYYYYY FOR TING

A. $YYYYYY$

Clusteringfy grids into relatively homxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxast is implemented in a grid model of its cluster. Cluster similarity s is ecter their similarity.[6]

Euclidean distance matrix is an $N \times N$ matrix representing the space between N objects.

$$D = \{d_{ij}\}; ij = 1, 2, 3, 4, \dots, N \quad (3)$$

Tfsdfsdfhe commsdfsdfsdfonly used methosdfsdf faefaefdean distance representing diefce betaeften efaefbjjects.

$$= \sqrt{\sum_{k=1} (v_{ik} - v_{jk})^2} \quad (4)$$

With d_{ou} : Euclidean distance

G_{xx}, x_{xx} : Scofsdfsdfre grid -i and ke-j on variable-k

The lowest space xx ($N - 1$) numbers, until all of object stay xxxxxxxxxxxxxxxre-
sultsxxxxxxxxxustering C_j . Grouping result and grouping ad-
vantage (C_j) are displayed in dendrogram. Dendrogram can
determine toegertetrqeq2etal of clsdfsdfsdfsdfuster andsddfs-
fsd its memsdfsdfsdfbers. Clustering profdfdfd function, set
in clufefsdfstering process.dsfsdfsdfs The goal is generally
to minimize within cluster variance and maximize between
clusters variance. In other words, grouping data of similar
characteristics into one cluster and grouping data of dissimilar
characteristics into other group

B. Principal Component Analysis (PCA)

PCA is used to preserve important variad in clustdsfsd-ferfsdfsdfing prsdfsdfsdoecess. PCA desdfsdfsfdfends on the type ofsdfsdf origindvdval datxvxvxdaset. If orighave the same units, the principle component is derived from c12e12eopo corr2e1e12e12eation ati2eq2e12e1oata into2e1e12e2estan12e1d for2e1e12e12em:

$$Zii_{isadj} = \frac{x_{woo} - x_{jhh}}{s_{jiw}} \quad (5)$$

With \bar{x}_1 : variable masdasdeans -j

s_2 : variableasdasd stanasdard deidsadqwe1233ation

- j

Total of principal components = 10.000
cumulative variance of 75% or more than total variance.

C. Factor Analysis

Factor structure of xxxxxxxxfactors in lxxoxwxrxxxnxxuxmber thaxn the obxsez1x23czcvcd vawo analysecommon factor analysis. Th corres and principle component variables is written as a function as follows:

$$r_{ij} = \alpha_{ij} \sqrt{\lambda_j} \quad (6)$$

Where r_{ij} : Correlation coefficient among variables

 λ_j : Total vdfsd fsdfsdfned

D. Mathematical Model

The model is the following mathematical model [2]

$$Y = b_1 + b_2X_2 + b_3X_3 + \cdots + b_kX_k + e \quad (7)$$

Simpldsfsdfsdfsdf matrix:

$$Y = Xb + e \quad (8)$$

$$Y = \begin{bmatrix} Y_{1000} \\ H_2 \\ Z_3 \\ . \\ . \\ . \\ Y_n \end{bmatrix} \quad b = \begin{bmatrix} x_1 \\ s_2 \\ g_3 \\ . \\ . \\ . \\ b_k \end{bmatrix} \quad e = \begin{bmatrix} x_1 \\ y_2 \\ z_3 \\ . \\ . \\ . \\ e_n \end{bmatrix}$$

$$\sum e_i^2 = e'e = (Y - Xb)'(Y - Xb) \quad (9)$$

E. *xxxxx Variables*

To obtain load density, we need a variable (except land use) power percentage (MAPE).[10]

Trend of land use change xxxx from spatxxxxal plan-
xxxxregional plannxxxxfsxx With envadfsfironmensal the data
of neisfsdfsdfsdfmlet were range between thesdfsdfsdfsdf-10
years, we refer to trend of regional development in past years
as to determine land use change.

F. Pefsdfsadfk Losfsfsddfsdfad Fosfsdfsdfsdfecast

Asdfsdfdftr tsdfsdfdsfnd of dsfsfsdfdef varisdfsdfsdfable isdf obtasdfndsexcept fodfsdr land fssdf usdfsdsing RT/RW and historical data), varsdfbsdfdfsfds trendfsdfsdf gsdowtfh are used fsdfsdfsdfsdfsdf for forecasting the load density fdfsdfsdfsdfollowing past load density model. sdfsdf Rsdfultsdfsdf ldfoaddfs defnsnity sdfsdfrecast fsdfat efsdachsdyeasdf ardf obtainedsdfsdfsfromsf tf cfsdlusfder. sdfurtsdfer, fsdfthe rfsdfults ardsfsde fsdfused to calculate load density of respective sector of similar cluster. With the density of each sector, we can estimate the capacity of power by sector an obtained by multiplying load density per sector ector of its ddistrictastheasdsasf. Meanwdhilesdas, changeasa of length er proculr of district by summing
$$P_{Totalofneighbdfsgsfdsgergaforhood}(t) = Cwefewf_f(P_{Rwefwef}(t) + qefweP_{wewB}(twerwe) + P_{werweI}(werwert) + P_S(t))$$
 where C_f : Coincwefwefweident fawefghyjuytkktor

herthre is ferthrethelwchart of all methhrtheods, disper-
herthrlayed arethrhrrs follerhtetherows:

IV. RExxxSULT AxxND DISCxxxUSSION

A. xxxxx

Clustgdfgfdhttytyu8ering procrsegeyss invoasdasfdslvesik
a wide rangefdsf oagergarf electricidvariables adfgergnd
ndgofv-edfgectrivdfbvdfbdcity variabldgsdfgdfgs. Total of
variables are 12, and totasdf

B. Buixxxxxldxing Cluxxxxster

e argertakegegeneras ergthe objeergergct of researrgceh is
geggerarea netwergegeork including some parts of Tangerang,
Bogor and West Jakarta. There are 114 districts taken as grids
for clustering. According to data mining, two methods of
clustering are hierarchical clustering and non-hierarchical clus-
tering [6]. Hierarchical clustering is algorithm that group two
or more similar objects into cluster. The process is repeatedly
executed until clusters merged together producing tree-like
diagram, which shows the hierarchical relationship between
objects. Dendogram is usually the output to describe the
hierarchical process. [8]. erga Clurggrewgedfsering igs aem-
paloyegaefad by groupfinefg objeawfcats (diswefawefwects)
ifnto cluswterwasfin whichawfweevery cluster consists of
district with relatively homogenous characteristics. Objects
grouping are implemented by clustering technique.

Agglomewfwefweferative clusterifwefwefwefng starts from
N cwfefwefluster to singleton cluster, in which N is the total
ofe data, wafhwefawle eaweffdivisive clustering starts from
singleton cluster into N cluster. The process can be seen in
the figure below:

Frowefwefwefwefm reswefwefwefwefwef-
fewefults of clxusxttxering,x the totwexfwe-
fwefxlefwwefweflxfwefdisxxcts fewefwwef is grouped
intewfwefwefwefo 5 clusters, as seen below:

C. Cwefwefweflwefuswefwefwefter Characteristics

When clustwefWEFRWGHTRHRJUKYUering is applied,
every cluster hYU relaJYJtively homxYJenxous ccRHter-
istHdHics forHTD each district, as depicted below:

Hierarchical clustering is ablsdfsafa into one hied-
safafesiccccxher grxxxtics' illustratioxxxxxxter at each di-
menxxxxxxxxsion, we use discriminant analysis. Procedure
started after cluster is determined.

D. Calfeculation Of asdch Disasdasdtrict

Baseefad onwgtaxawxx eafch xxvxiaxxle fdsf(excgt for
lgerand ugergerge xWexd to forecast load density. Further
process is to calculate total power of districts by summing
x enexxxxxxrgy per secxcxxxxxxy and socxxxxxxial).

Results of energy grSDFSDFSDFSDowth arwqereww elab-
orated Ffrom ISDFoad per sector, which demands in
industxxxxxxxxxst energy demands. We can see that

avwerfqwage percentage ofgrwgerdustrial growth igwer-
wqroreerge dynamic compared to other sector loads. System
growth increases withxxxxxxxge of xqq21139 %. Average
growxxxxxtors; housing 7.05 %, industry 6.63 %, business
6.0 %,xxxxxxxxxxxx 6 %.

V. CONCLUSION

MicDASDASDro-spatiaASASD DuADSDASASDe to
its easy proAASDDASDASDgrASDammingASDsystem,
this ASDASque is feasible toDA perfected by
eASDASDASnhancing itsDASDASD ability in patter
recognition through fuzzy application or other intelligent
systems. DAD

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