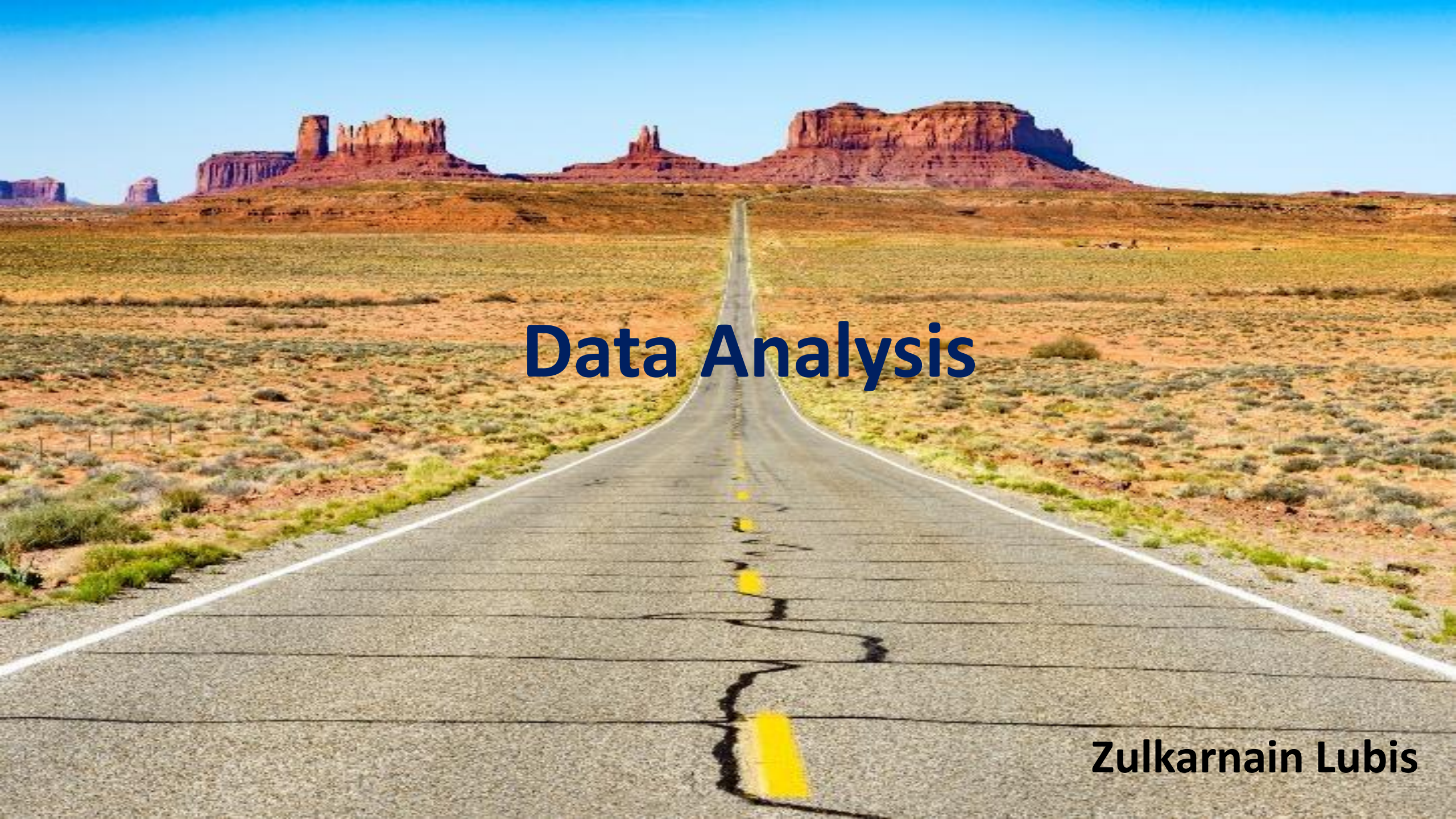
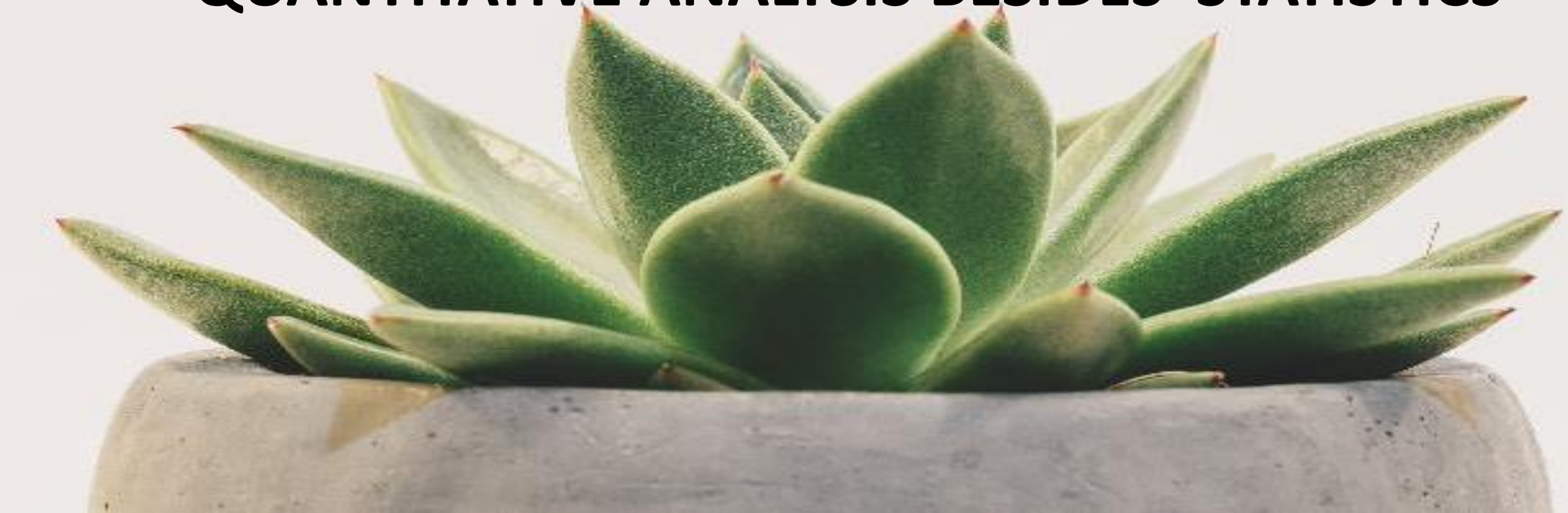

Data Analysis
Zulkarnain Lubis

Data Analysis

- QUALITATIVE ANALYSIS
- STATISTICAL ANALYSIS
- QUANTITATIVE ANALYSIS BESIDES STATISTICS



Qualitative Data Analysis

- Qualitative data result from the collection of non-standardised data that require classification and are analysed through use of conceptualisation
- Qualitative analysis can involve summarising, categorising and structuring data
- The process of data analysis and collection are necessarily interactive

STATISTICAL ANALYSIS

Explorative Data Analysis

- Searching and disclosure of structure and pattern of existing data,
- checking the form and pattern of distribution of data,
- revealing the presence of irregularities
- Using simple arithmetics and graphs

Confirmative Data Analysis

- Finding information about a population based on a sample,
- Performing inference or generalization from sample to population
- Consideration of strict assumptions

Hypothesis Test

STATISTICAL ANALYSIS

- **Descriptive Statistics: Part of statistics which is specifically used to describe data; describing visually and measurement**
- **Inductive Statistics: Part of Statistics for taking formal conclusions and generalizing to population based on data sample; classified on Parametric Statistics and Non-Parametric Statistics**

Hypothesis Test

Descriptive Statistics

Visually

- **Table: Cross Tabulation, Frequency Tables, etc.**
- **Figure/Picture/ Chart/Graph: Histogram, Bar Chart, Plot Diagram, Box-Plot Diagram, Pie Chart, Run Chart, Control Chart, Time Series graph, Stem and Leaf Diagram**

By measurement

- **Measures of central tendency or measure of location: mean, median, modus, midrange, midhinge**
- **Measures of dispersion: range, variance, standard deviation, standard deviation, absolute deviation, inter-quartile range**
- **Other measures: proportion, percentages, ratio**

Descriptive Statistics

Visually	By measurement
• Table: Cross Tabulation, Frequency Tables, etc. • Figure/Picture/ Chart/Graph: Histogram, Bar Chart, Plot Diagram, Box-Plot Diagram, Pie Chart, Run Chart, Control Chart, Time Series graph, Stem and Leaf Diagram	• Measures of central tendency or measure of location: mean, median, modus, midrange, midhinge • Measures of dispersion: range, variance, standard deviation, standard deviation, absolute deviation, inter-quartile range • Other measures: proportion, percentages, ratio

Analisis Statistik Deskriptif; Mendeskripsi Secara Visual

- **Mengidentifikasi Pola Penyebaran Data**
  - histogram
  - diagram dahan dan daun (*stem and leaf diagram*)
  - diagram kotak garis (*box-plot diagram*)
- **Mengidentifikasi Hubungan Antar Variabel dengan Gambar dan Tabel**
  - tabulasi silang *(cross tabulation)*; untuk data kategorikal
  - diagram plot *(plot diagram):* untuk data kontiniu *(continuous data).*

Analisis Statistik Deskriptif; Mendeskripsi Secara Visual

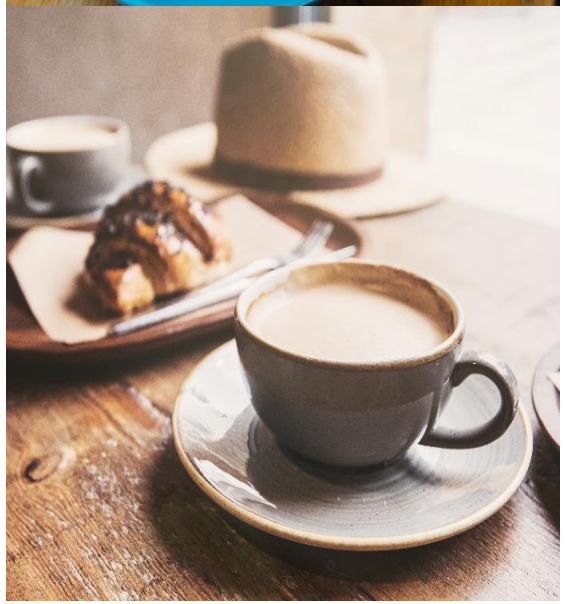
- **Peramalan, Identifikasi Masalah, dan Pengamatan Proses**
  - ***run chart,***
  - ***control chart,***
  - **grafik deret waktu *(time series graph)***
- **Mendeskripsi Penyebaran Data Untuk Skala Nominal**
  - **bagan melingkar *(pie chart)***
  - **diagram batang *(bar chart)***

Analisis Statistik Deskriptif; Mendeskripsikan Menggunakan Ukuran

- **ukuran pemusatan atau ukuran kecenderungan memusat *(measures of central tendency)* atau disebut juga sebagai ukuran lokasi *(measure of location):***
  - **rata-rata *(mean)*, median, modus, *midrange, midhinge***
- **ukuran penyebaran *(measures of dispersion)*:**
  - **ragam atau variansi *(variance),* standar deviasi (*standard of deviation*), jangkauan atau kisaran *(range),* jarak antar kuartil *(inter quartile distance)***
- **ukuran-ukuran lain:**
  - **proporsi (*proportion*), nisbah (*ratio*), persentase (p*ercentage),* peragam *(covariance).***

Frequencies; Histogram Frequency, Descriptive Statistics; Deskripsi Data, Explore, Crosstab

- Histogram
- rata-rata *(mean),*
- median,
- modus,
- *midrange,*
- *Midhinge*
- *Quartile*
- Stem And Leaf Diagram
- Plot Diagram
- Box-plot Diagram
- *Skewness*
- *Curtosis*
- *Variance*
- *standard of deviation*
- *Range*
- *inter quartile distance*



Inductive Statistics

Parametric Statistics

Parametric Statistics: based on strict assumptions relating to the characteristics of the population from which data were obtained

Such assumptions: normal distribution, independent, homogenous variance

Usually used interval and ratio scale of measurement

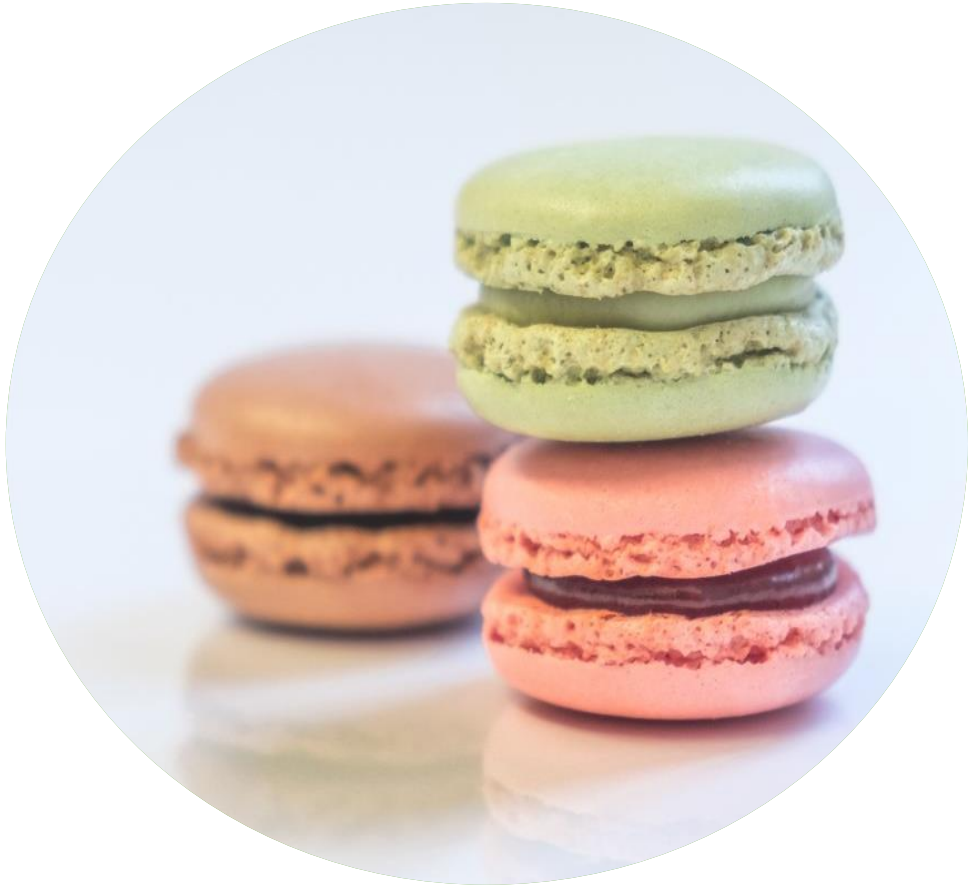
Suitable for natural science

Non-Parametric Statistics

- Non-Parametric Statistics: The assumptions are not so strict , the assumption is usually required only symmetry
- Can be used for an ordinal, interval, and ratio scale of measurement
- Suitable social sciences which are sometimes the data are difficult to be quantified

Berbagai Jenis Analisis Statistik dan Uji hipotesis

- **analisis statistik univariat (univariate statistical analysis) yang merupakan uji hipotesis terhadap hanya satu variabel**
- **analisis statistik bivariate (bivariate statistical analysis) yang merupakan uji hipotesis untuk dua variabel**
- **analisis statistik multivariat (multivariate statistical analysis) yang merupakan uji hipotesis untuk banyak variabel**



Uji Hipotesis

- hipotesis relasional (relational hypothesis) berupa uji hipotesis pengaruh perubahan satu variabel kepada perubahan variabel lainnya
- hipotesis untuk mengidentifikasi perbedaan antar group untuk melakukan pengujian apakah nilai satu variabel berbeda antara satu group dengan group lainnya
- hipotesis untuk melakukan pengujian apakah nilai variable tertentu sama besar atau berbeda dengan satu ukuran yang telah ditentukan

Test for population mean

- **One sample t test for population mean**
- **T test for comparing two population means**
- **ANOVA for testing population means of k independent**

Uji Hipotesis Relasional

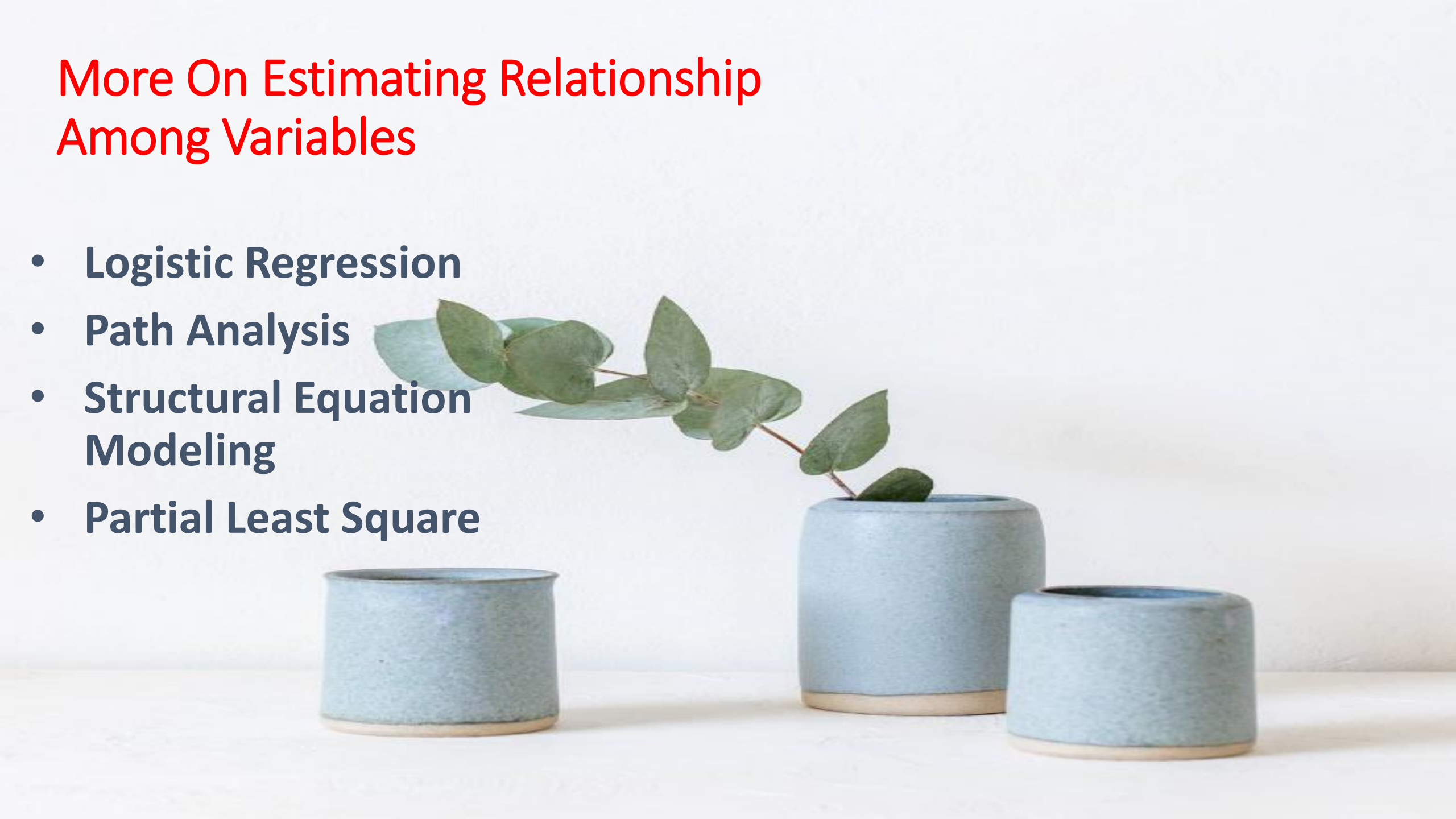
- sekadar keeratan hubungan, digunakan koefisien korelasi
- mengetahui pengaruh satu atau lebih variabel terhadap variabel lain, digunakan analisis regresi
- analisis regresi, dua jenis variabel:
  - variabel yang mempengaruhi (variabel bebas)
  - variabel yang dipengaruhi (variabel tak bebas)
- uji hipotesis untuk analisis regresi, apakah perubahan variabel bebas signifikan memberi perubahan pada variabel tak bebas
- untuk analisis korelasi, hanya sekedar ingin mengidentifikasi keeratan hubungan dua variabel tanpa memerlukan yang mana yang mempengaruhi dan yang mana yang dipengaruhi.

ESTIMATING RELATIONSHIP AMONG VARIABLES

- **Simple correlation**
- **Simple linear regression**
  - **Population:** $\mu_{Yi} = \beta_0 + \beta_1 Xi$, Yi = $\beta_0 + \beta_1 Xi + \epsilon i$, Yi = $\mu_{Yi} + \epsilon i$
  - **Sample :** $Y = b_0 + b_1 Xi + e$, $\widehat{Y} = b_0 + b_1 X$, $e = Y - \widehat{Y}$
- **Multiple linear regression**
  - **Population:** Yi = $\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + \epsilon i$
  - **Sample :** $Y = b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_k X_k + e$
- **Non-linear regression**

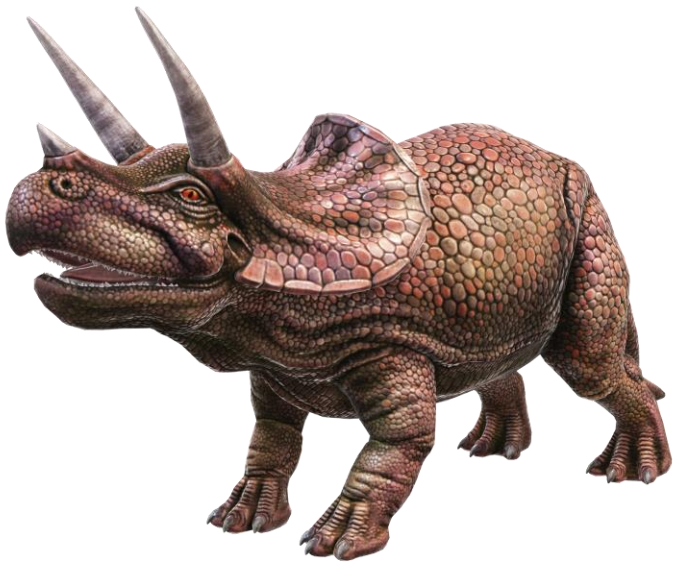
More On Estimating Relationship Among Variables

- Logistic Regression
- Path Analysis
- Structural Equation Modeling
- Partial Least Square



Statistika Nonparametrik

- **Ketika asumsi statistika parametrik tak dapat dipenuhi**
- **Test yang dilakukan kekuatannya lebih rendah daaripada statistika parametrik**



- **In general, statistical parametric and non-parametric statistics have equivalent analytical tools that can be used for the same purpose**

The Pair of Data Analysis Tools of Parametric and Non Parametric Statistics		
Hypothesis	**Parametric**	**Non Parametric**
• One sample or paired samples	Z-test or t-test	Sign test or Wilcoxon sign test
• Two independent samples	Z-test or t-test	Mann-Whitney-(Wilcoxon) test
• Many independent samples	F-test (ANOVA)	Kruskal Wallis test or Friedmen test
• The parameters of location or dispersion of two independent samples	F-test	Siegel Tukey test
• Association or Correlation Analysis	Pearson Correlation or $\chi 2$ test or F-test	Spearman Correlation or Tau Kendall Correlation

Good Luck

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