STA 3180 Statistical Modelling: Structural Equation Modeling

Structural Equation Modeling (SEM)

Introduction:

Structural equation modeling (SEM) is a statistical technique used to analyze the relationships between observed and latent variables. It is a form of multivariate analysis that allows researchers to test complex hypotheses about relationships among variables. SEM is a powerful tool for testing theories, making predictions, and interpreting data.

Key Concepts:

1. Latent Variables: Latent variables are variables that cannot be directly measured but can be inferred from other variables. Examples of latent variables include attitudes, beliefs, and values.

2. Observed Variables: Observed variables are variables that can be directly measured. Examples of observed variables include age, gender, and income.

3. Path Analysis: Path analysis is a type of SEM that is used to examine the direct and indirect effects of one or more variables on another variable.

4. Factor Analysis: Factor analysis is a type of SEM that is used to identify the underlying factors that influence a set of variables.

5. Structural Equation Modeling: Structural equation modeling is a type of SEM that is used to test hypotheses about the relationships between observed and latent variables.

Definitions:

1. Latent Variable: A latent variable is an unobservable variable that is inferred from other variables.

2. Observed Variable: An observed variable is a measurable variable that can be directly observed.

3. Path Analysis: Path analysis is a type of SEM that is used to examine the direct and indirect effects of one or more variables on another variable.

4. Factor Analysis: Factor analysis is a type of SEM that is used to identify the underlying factors that influence a set of variables.

5. Structural Equation Modeling: Structural equation modeling is a type of SEM that is used to test hypotheses about the relationships between observed and latent variables.

Rules:

1. All variables must be measured on the same scale.

2. The model must be specified in terms of the relationships between the observed and latent variables.

3. The model must be tested for goodness of fit.

4. The model must be interpreted in terms of the relationships between the observed and latent variables.

Examples:

1. Path Analysis: A researcher is interested in examining the relationship between students' academic performance and their attitudes towards school. The researcher could use path analysis to examine the direct and indirect effects of attitudes on academic performance.

2. Factor Analysis: A researcher is interested in examining the underlying factors that influence students' academic performance. The researcher could use factor analysis to identify the underlying factors that influence academic performance.

3. Structural Equation Modeling: A researcher is interested in testing a hypothesis about the relationship between students' attitudes towards school and their academic performance. The researcher could use structural equation modeling to test the hypothesis.