**Latent Features and Manifolds**

* A latent variable is a variable that is not directly observable and is assumed to affect the response variables (manifest variables).
* Latent variables are used to represent the effect of these unobservable factors.
* These variables which you can’t measure on a quantitative scale are called latent variables.
* Benefits of using Latent Variable Models:
* i)Fewer Parameters
* ii)Simple Model
* iii)Easy to interpret.
* Drawbacks: Harder to train
* Sometimes there might not be the use of latent variables as it introduces an extra parameter and it becomes harder to train with.

**Latent Variable Models**

* Factor analysis model: a fundamental tool in multivariate statistics to summarize several (continuous) measurements through a small number of (continuous) latent traits; no covariates are included.
* Item Response Theory models: models for items (categorical responses) measuring a common latent trait assumed to be continuous (or less often discrete) and typically representing an ability or a psychological attitude.
* Generalized linear mixed models (random-effects models): extension of the class of Generalized linear models (GLM) for continuous or categorical responses which account for unobserved heterogeneity, beyond the effect of observable covariates.
* Finite mixture model: model, used even for a single response variable, in which subjects are assumed to come from subpopulations having different distributions of the response variables; typically covariates are ruled out.
* Latent class model: a model for categorical response variables based on a discrete latent variable, the levels of which correspond to latent classes in the population; typically covariates are ruled out.
* Finite mixture regression model (Latent regression model): version of the finite mixture (or latent class model) which includes observable covariates affecting the conditional distribution of the response variables and/or the distribution of the latent variables.
* Models for longitudinal/panel data based on a state-space formulation: models in which the response variables (categorical or continuous) are assumed to depend on a latent process made of continuous latent variables.
* Latent Markov models: models for longitudinal data in which the response variables are assumed to depend on an unobservable Markov chain, as in hidden Markov models for time series; covariates may be included in different ways.
* Latent Growth/Curve models: models based on a random-effects formulation which are used the study the evolution of a phenomenon across time on the basis of longitudinal data; covariates are typically ruled out.

**Relevant Articles to Real Estate Investment (House Price Prediction)**

* <https://towardsdatascience.com/automating-real-estate-investment-analysis-d2b07395833b>
* <https://www.forbes.com/sites/forbesbizcouncil/2021/10/04/how-real-estate-investors-can-use-artificial-intelligence/?sh=707cbd67454d>
* <https://www.linkedin.com/pulse/real-estate-investing-machine-learning-part-1-valentino-pintea-cfa/>
* <https://www.irjet.net/archives/V4/i3/IRJET-V4I3499.pdf>