**Understanding Generative and Discriminative Model**

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| Generative Model | Discriminative Model |
| A model for generating all values for a phenomenon. Both those that can be obsereved in the world and target varibles that can be only calculated from those obsereved is called Generative model. | A model by which we can only generate values for the target varibles by analyzing the obsereved values or variables is called Discriminative Model. |
| It generates both inputs and outputs, typically given some hidden parameters. | It infers outputs baesd on inputs. |
| Generally probabilitic, specifying a joint probability distribution over observed and target variables. | Don’t need to model the distribution of observed variables, they cannot generally express complex relationship between observed and target variables. |
| It cares about how the data was generated in order to categorize a signal. | It doesn’t care about how the data was generated. |
| Given input data X and set of labels Y -  learns joint probability distribution P(x,y) | Given input data X and set of labels Y -  learns conditional probability distribution P(y|x) |
| Try to learn P(x,y) which can be transfered into P(y|x) | Try to learn P(y|x) directly from the data and than try to calssify data. |
| Advantage:  We can use P(x,y) to generate new data similat to exisiting data. | Advantage:  Generally give better performance in classification tasks. |
| Examples:  Naives Bayes, Latent Dirichlet Allocation, Probabilistic context free grammer,  Hidden Markov Models,  Gaussian Mixture Models,  Avereged one dependece estimation,  Restricted Boltzman Machine(RBM),  Generative Adversial Network. | Examples:  Logistic Regression, Linear Regression, SVM, Maximum Entropy Markov Model,  Conditional Random Fields,  Neural Networks, Random forests, Boosting. |