

# ADDITIONAL MATERIAL FOR MICRO-LECTURE TOPICS

## 1.Representation

### List 1:

<https://developers.google.com/machine-learning/crash-course/representation/video-lecture>  
<https://developers.google.com/machine-learning/crash-course/representation/qualities-of-good-features>  
<https://datawarrior.wordpress.com/2019/09/15/data-representation-in-machine-learning/>

### List 2:

[https://medium.com/@paritosh\\_30025/natural-language-processing-text-data-vectorization-af2520529cf7](https://medium.com/@paritosh_30025/natural-language-processing-text-data-vectorization-af2520529cf7)  
<https://www.samtalksml.net/from-linear-regression-to-vector-representations>

## 2.Nearest Neighbour Method

### List 1:

<https://towardsdatascience.com/a-simple-introduction-to-k-nearest-neighbors-algorithm-b3519ed98e>  
<https://www.youtube.com/watch?v=6kZ-OPLNcgE>

### List 2:

<http://people.csail.mit.edu/dsontag/courses/ml13/slides/lecture11.pdf>  
[https://en.wikipedia.org/wiki/K-nearest\\_neighbors\\_algorithm](https://en.wikipedia.org/wiki/K-nearest_neighbors_algorithm)

## 3.Linear Classifier

### List 1:

[https://en.wikipedia.org/wiki/Linear\\_classifier](https://en.wikipedia.org/wiki/Linear_classifier)  
<https://www.coursera.org/lecture/ml-classification/linear-classifier-model-XBc9n>

### List 2:

[http://compneurosci.com/wiki/images/c/c0/Linear\\_Classification.pdf](http://compneurosci.com/wiki/images/c/c0/Linear_Classification.pdf)

## 4.Performance Metrics-I

### List 1:

<https://towardsdatascience.com/beyond-accuracy-precision-and-recall-3da06bea9f6c>

### List 2:

[https://www.youtube.com/watch?v=j-EB6RqqjGI&ab\\_channel=CodeEmporium](https://www.youtube.com/watch?v=j-EB6RqqjGI&ab_channel=CodeEmporium)

## 5. Performance Metrics-II

### List 1:

<https://blog.exsilio.com/all/accuracy-precision-recall-f1-score-interpretation-of-performance-measures/>

[https://medium.com/@jonathan\\_hui/map-mean-average-precision-for-object-detection-45c121a31173#:~:text=The%20general%20definition%20for%20the,within%20%20and%201%20also.](https://medium.com/@jonathan_hui/map-mean-average-precision-for-object-detection-45c121a31173#:~:text=The%20general%20definition%20for%20the,within%20%20and%201%20also.)

#### **List 2:**

[https://en.wikipedia.org/wiki/Evaluation\\_measures\\_\(information\\_retrieval\)#Average\\_precision](https://en.wikipedia.org/wiki/Evaluation_measures_(information_retrieval)#Average_precision)

[https://en.wikipedia.org/wiki/Precision\\_and\\_recall](https://en.wikipedia.org/wiki/Precision_and_recall)

[https://en.wikipedia.org/wiki/F1\\_score](https://en.wikipedia.org/wiki/F1_score)

### **6.Representation-II**

#### **List1:**

<https://medium.com/inside-machine-learning/feature-engineering-for-deep-learning-2b1fc7605ace>

<https://towardsdatascience.com/unsupervised-feature-learning-46a2fe399929>

#### **List 2:**

<https://towardsdatascience.com/art-of-vector-representation-of-words-5e85c59fee5>

### **7.Data from Multivariate Gaussians**

#### **List 1:**

<https://scipython.com/blog/visualizing-the-bivariate-gaussian-distribution/>

<https://medium.com/@SeoJaeDuk/archived-post-multivariate-gaussian-distributions-and-entropy-3-991578ca534c>

#### **List 2:**

[https://en.wikipedia.org/wiki/Normal\\_distribution](https://en.wikipedia.org/wiki/Normal_distribution)

<https://www.mathsisfun.com/data/standard-normal-distribution.html>

### **8.Curse of Dimensionality**

#### **List 1:**

[https://en.wikipedia.org/wiki/Curse\\_of\\_dimensionality](https://en.wikipedia.org/wiki/Curse_of_dimensionality)

[https://www.youtube.com/watch?v=\\_4DaqzLyT08](https://www.youtube.com/watch?v=_4DaqzLyT08)

#### **List 2:**

<https://towardsdatascience.com/the-curse-of-dimensionality-50dc6e49aa1e>

[https://www.inf.fu-berlin.de/inst/ag-ki/rojas\\_home/documents/tutorials/dimensionality.pdf](https://www.inf.fu-berlin.de/inst/ag-ki/rojas_home/documents/tutorials/dimensionality.pdf)

### **9.Feature Selection and Extraction**

#### **List 1:**

<https://medium.com/@mehulved1503/feature-selection-and-feature-extraction-in-machine-learning-an-overview-57891c595e96>

**List 2:**

<https://towardsdatascience.com/getting-data-ready-for-modelling-feature-engineering-feature-selection-dimension-reduction-39dfa267b95a>

<https://medium.com/@mayankshah1607/machine-learning-feature-selection-with-backward-elimination-955894654026>

## **10.Data as Matrix**

**List 1:**

<https://www.quora.com/What-is-an-intuitive-explanation-of-the-rank-of-a-matrix>

**List 2:**

[https://medium.com/@jonathan\\_hui/machine-learning-linear-algebra-a5b1658f0151](https://medium.com/@jonathan_hui/machine-learning-linear-algebra-a5b1658f0151)

## **11.Supervised Learning: Formulation**

**List 1:**

[https://medium.com/@jonathan\\_hui/machine-learning-linear-algebra-a5b1658f0151](https://medium.com/@jonathan_hui/machine-learning-linear-algebra-a5b1658f0151)

**List 2:**

<https://medium.com/swlh/ml-fundamentals-optimization-problems-and-how-to-solve-them-572c6ddf0a0b>

## **12.Eigen Decomposition**

**List 1:**

<http://fourier.eng.hmc.edu/e176/lectures/algebra/node9.html>

<https://online.stat.psu.edu/statprogram/reviews/matrix-algebra/eigendecomposition>

**List 2:**

<https://personal.utdallas.edu/~herve/Abdi-EVD2007-pretty.pdf>

<https://drive.google.com/file/d/1t1cobzqcmG43QQTOzKYmmXhvTQbDcJDx/view?usp=sharing>  
(Section 4.4)

[https://en.wikipedia.org/wiki/Eigendecomposition\\_of\\_a\\_matrix#:~:text=In%20linear%20algebra%2C%20eigendecomposition%20or,be%20factorized%20in%20this%20way.](https://en.wikipedia.org/wiki/Eigendecomposition_of_a_matrix#:~:text=In%20linear%20algebra%2C%20eigendecomposition%20or,be%20factorized%20in%20this%20way.)

## **13.Distances and Similarities**

**List 1:**

<https://towardsdatascience.com/how-to-measure-distances-in-machine-learning-13a396aa34ce>

<https://towardsdatascience.com/light-on-math-machine-learning-intuitive-guide-to-understanding-kl-divergence-2b382ca2b2a8>

<https://deeptai.org/machine-learning-glossary-and-terms/jaccard-index#:~:text=The%20Jaccard%20Index%2C%20also%20known,union%20of%20the%20sample%20sets>

<https://dzone.com/articles/machine-learning-measuring>

<https://medium.com/x8-the-ai-community/understanding-similarity-measures-in-ml-33deb0bf094>

List 2:

<https://www.ias.ac.in/article/fulltext/reso/004/06/0020-0026>

## 14. Generalization and Overfitting

List 1:

<https://towardsdatascience.com/generalization-regularization-overfitting-bias-and-variance-in-machine-learning-aa942886b870>

<https://www.quora.com/What-is-generalization-in-machine-learning>

<https://towardsdatascience.com/what-are-overfitting-and-underfitting-in-machine-learning-a96b30864690>

<https://www.quora.com/How-do-we-know-whether-a-model-is-overfitting>

## 15. Linear Regression

List 1:

<https://drive.google.com/file/d/19lley-v-tsbR-66RcQQXf41n8pyAWqcM/view?usp=sharing>

<https://towardsdatascience.com/introduction-to-machine-learning-algorithms-linear-regression-14c4e325882a>

List 2:

<https://drive.google.com/file/d/1t1cobzqcmG43QQTOzKYmmXhvTQbDcJDx/view?usp=sharing> (Chapter 9)

## 16. Optimization and Eigen Vectors

List 1:

<https://joellaity.com/2018/10/18/pca.html>

<http://www.stat.cmu.edu/~cshalizi/uADA/12/lectures/ch18.pdf>

List 2:

<https://arxiv.org/pdf/1903.11240.pdf>

## 17. MLE

List 1:

<https://www.coursera.org/lecture/probabilistic-graphical-models-3-learning/maximum-likelihood-estimation-KzIS4>

**List 2:**

<http://jrmeyer.github.io/machinelearning/2017/08/18/mle.html>

## **18.SVD**

**List 1:**

[https://web.mit.edu/be.400/www/SVD/Singular\\_Value\\_Decomposition.htm](https://web.mit.edu/be.400/www/SVD/Singular_Value_Decomposition.htm)

<https://blog.statsbot.co/singular-value-decomposition-tutorial-52c695315254>

**List 2:**

[https://medium.com/@jonathan\\_hui/machine-learning-singular-value-decomposition-svd-principal-component-analysis-pca-1d45e885e491](https://medium.com/@jonathan_hui/machine-learning-singular-value-decomposition-svd-principal-component-analysis-pca-1d45e885e491)

<https://towardsdatascience.com/understanding-singular-value-decomposition-and-its-application-in-data-science-388a54be95d>

## **19.MSE as MLE**

**List 1:**

<https://www.jessicayung.com/mse-as-maximum-likelihood/>

## **20.Geometry of Gaussians**

**List 1:**

<https://towardsdatascience.com/an-intuitive-guide-to-gaussian-processes-ec2f0b45c71d>

**List 2:**

<http://www.gaussianprocess.org/gpml/chapters/RW.pdf>

## **21.Bayesian Minimum Error Classification**

**List 1:**

<https://neumachine.net/minimum-error-rate-classification/>

**List 2:**

[https://www.byclb.com/TR/Tutorials/neural\\_networks/ch4\\_1.htm](https://www.byclb.com/TR/Tutorials/neural_networks/ch4_1.htm)

## **22.Occam's Razor**

**List 1:**

[https://www.youtube.com/watch?v=Q\\_AclBHCaUo](https://www.youtube.com/watch?v=Q_AclBHCaUo)

**List 2:**

<https://www.techopedia.com/how-does-occams-razor-apply-to-machine-learning/7/33087>

## 23.Validation

List 1:

[https://en.wikipedia.org/wiki/Training\\_validation\\_and\\_test\\_sets](https://en.wikipedia.org/wiki/Training_validation_and_test_sets)

<https://towardsdatascience.com/5-reasons-why-you-should-use-cross-validation-in-your-data-science-project-8163311a1e79>

List 2:

<https://www.analyticsvidhya.com/blog/2018/05/improve-model-performance-cross-validation-in-python-r/>

<https://www.coursera.org/lecture/big-data-machine-learning/using-a-validation-set-Pb8Cl>

## 24.Bias and Variance

List 1:

<https://towardsdatascience.com/understanding-the-bias-variance-tradeoff-165e6942b229>

[https://www.youtube.com/watch?v=EuBBz3bl-aA&ab\\_channel=StatQuestwithJoshStarmerr](https://www.youtube.com/watch?v=EuBBz3bl-aA&ab_channel=StatQuestwithJoshStarmerr)

List 2:

<https://www.kaggle.com/residentmario/bias-variance-tradeoff>

## 25.Loss Functions I

List 1:

<https://algorithmia.com/blog/introduction-to-loss-functions>

<https://www.analyticsvidhya.com/blog/2019/08/detailed-guide-7-loss-functions-machine-learning-python-code/>

List 2:

<https://machinelearningmastery.com/loss-and-loss-functions-for-training-deep-learning-neural-networks/>

## 26.LSI

List 1:

<https://www.youtube.com/watch?v=OvzJiur55vo>

[https://en.wikipedia.org/wiki/Latent\\_semantic\\_analysis](https://en.wikipedia.org/wiki/Latent_semantic_analysis)

List 2:

<http://lsa.colorado.edu/papers/dp1.LSAintro.pdf>

## 27.Regularization in Regression

List 1:

<https://towardsdatascience.com/regularization-in-machine-learning-76441ddcf99a>

List 2:

<http://www.sthda.com/english/articles/37-model-selection-essentials-in-r/153-penalized-regression-essentials-ridge-lasso-elastic-net/#discussion>

## 28.Rank and Recommendation System

List 1:

<https://towardsdatascience.com/introduction-to-recommender-systems-6c66cf15ada>  
<https://tryolabs.com/blog/introduction-to-recommender-system/>

List 2:

<https://towardsdatascience.com/recommender-system-using-bayesian-personalized-ranking-d30e98bba0b9>  
[https://medium.com/@jonathan\\_hui/machine-learning-recommender-system-e3237b9df14a](https://medium.com/@jonathan_hui/machine-learning-recommender-system-e3237b9df14a)

## 29.Orthogonal Line Fitting

List 1:

<https://drive.google.com/drive/folders/1UypmObLq5rjiSGyLMEHgQiguENN3PjHI?usp=sharing>  
<https://davegiles.blogspot.com/2014/11/orthogonal-regression-first-steps.html>

## 30.PCA

List 1:

<https://builtin.com/data-science/step-step-explanation-principal-component-analysis>  
<https://towardsdatascience.com/a-one-stop-shop-for-principal-component-analysis-5582fb7e0a9c>  
<http://people.ciirc.cvut.cz/~hlavac/TeachPresEn/11ImageProc/15PCA.pdf>

List 2:

[http://www.princeton.edu/~yc5/ele538b\\_sparsity/lectures/robust\\_PCA.pdf](http://www.princeton.edu/~yc5/ele538b_sparsity/lectures/robust_PCA.pdf)

## 31.Decision Boundaries for Multivariate Gaussians

List 1:

<https://www.cs.rit.edu/~rlaz/PatternRecognition/slides/Bayesian.pdf>

**List 2:**

<https://www.youtube.com/watch?v=Vn3gcovBI1A>

### **32. Deep Embeddings**

**List 1:**

[https://en.wikipedia.org/wiki/Feature\\_learning](https://en.wikipedia.org/wiki/Feature_learning)

<https://developers.google.com/machine-learning/crash-course/embeddings/video-lecture>

**List 2:**

<https://cloud.google.com/solutions/machine-learning/overview-extracting-and-serving-feature-embeddings-for-machine-learning>

[https://youtu.be/lmUoubi\\_t7s](https://youtu.be/lmUoubi_t7s)

### **33. PCA as Compression**

**List 1:**

<https://aaronschlegel.me/image-compression-principal-component-analysis.html>

**List 2:**

<https://www.intechopen.com/books/statistics-growing-data-sets-and-growing-demand-for-statistics/application-of-principal-component-analysis-to-image-compression>

### **34. Gradient Descent I**

**List 1:**

<https://www.coursera.org/lecture/machine-learning/gradient-descent-8SpIM>

<https://machinelearningmastery.com/gradient-descent-for-machine-learning/>

**List 2:**

<https://towardsdatascience.com/understanding-the-mathematics-behind-gradient-descent-dde5dc9be06e>

### **35. Normalization of Features**

**List 1:**

<https://towardsdatascience.com/understand-data-normalization-in-machine-learning-8ff3062101f0>

<https://medium.com/@urvashilluniya/why-data-normalization-is-necessary-for-machine-learning-models-681b65a05029>

[https://en.wikipedia.org/wiki/Feature\\_scaling](https://en.wikipedia.org/wiki/Feature_scaling)

**List 2:**



<https://www.analyticsvidhya.com/blog/2020/04/feature-scaling-machine-learning-normalization-standardization/>  
<https://towardsai.net/p/data-science/how-when-and-why-should-you-normalize-standardize-rescale-your-data-3f083def38ff>

### 36. Eigen Faces

List 1:

[https://en.wikipedia.org/wiki/Eigenface#:~:text=An%20eigenface%20\(%2F%CB%88a%C9%AA%C9%A1,Alex%20Pentland%20in%20face%20classification.](https://en.wikipedia.org/wiki/Eigenface#:~:text=An%20eigenface%20(%2F%CB%88a%C9%AA%C9%A1,Alex%20Pentland%20in%20face%20classification.)

<https://towardsdatascience.com/eigenfaces-recovering-humans-from-ghosts-17606c328184>

[https://www.youtube.com/watch?v=\\_IY74pXWIS8](https://www.youtube.com/watch?v=_IY74pXWIS8)

List 2:

<http://www.scholarpedia.org/article/Eigenfaces>

### 37. Gradient Descent II

List 1:

<http://s3.amazonaws.com/mitsloan-php/wp-faculty/sites/30/2016/12/15031226/Newton%E2%80%99s-Method-for-Unconstrained-Optimization.pdf>

<https://www.youtube.com/watch?v=sAT3mNr0TBg>

List 2:

<https://www.youtube.com/watch?v=o6FfdP2uYh4>

[https://www.cs.ccu.edu.tw/~wtchu/courses/2014s\\_OPT/Lectures/Chapter%209%20Newton%27s%20Method.pdf](https://www.cs.ccu.edu.tw/~wtchu/courses/2014s_OPT/Lectures/Chapter%209%20Newton%27s%20Method.pdf)

### 38. Perceptron Algorithm

List 1:

<https://medium.com/@nikhilc3013/simple-perceptron-training-algorithm-explained-7bbfdf2c57d>

<https://towardsdatascience.com/perceptron-learning-algorithm-d5db0deab975>

List 2:

<https://www.youtube.com/watch?v=BbYV8UfMJS>

<https://www.youtube.com/watch?v=wl7gVvI-Hu>

### 39. MSE as GD

List 1:

<https://towardsdatascience.com/gradient-descent-from-scratch-e8b75fa986cc>

**List 2:**

<https://mccormickml.com/2014/03/04/gradient-descent-derivation/>

**40. Neuron Model**

**List 1:**

[https://ml-cheatsheet.readthedocs.io/en/latest/nn\\_concepts.html](https://ml-cheatsheet.readthedocs.io/en/latest/nn_concepts.html)

[https://www.youtube.com/watch?v=aircAruvnKk&list=PLZHQObOWTQDNU6R1\\_67000Dx\\_ZCJB-3pi](https://www.youtube.com/watch?v=aircAruvnKk&list=PLZHQObOWTQDNU6R1_67000Dx_ZCJB-3pi)

**List 2:**

<https://towardsdatascience.com/machine-learning-for-beginners-an-introduction-to-neural-networks-d49f22d238f9>

<https://medium.com/towards-artificial-intelligence/main-types-of-neural-networks-and-its-applications-tutorial-734480d7ec8e>

<https://playground.tensorflow.org/>

**41. Variations in GD**

**List 1:**

<https://towardsdatascience.com/gradient-descent-algorithm-and-its-variants-10f652806a3>

**List 2:**

<https://ruder.io/optimizing-gradient-descent/>

**42. Perceptron II**

**List 1:**

<https://towardsdatascience.com/perceptron-algorithms-for-linear-classification-e1bb3dcc7602>

[https://cmci.colorado.edu/classes/INFO-4604/files/slides-3\\_perceptron.pdf](https://cmci.colorado.edu/classes/INFO-4604/files/slides-3_perceptron.pdf)

<https://www.youtube.com/watch?v=oGn1m7EReco>

**List 2:**

<https://www.youtube.com/watch?v=wl7gVvI-HuY>

[http://ml.informatik.uni-freiburg.de/former/\\_media/documents/teaching/ss09/ml/perceptrons.pdf](http://ml.informatik.uni-freiburg.de/former/_media/documents/teaching/ss09/ml/perceptrons.pdf)

**43. Naive Bayes**

**List 1:**

<https://www.analyticsvidhya.com/blog/2017/09/naive-bayes-explained/>

<https://monkeylearn.com/blog/practical-explanation-naive-bayes-classifier/>

**List 2:**

<https://machinelearningmastery.com/naive-bayes-for-machine-learning/>

<https://www.geeksforgeeks.org/naive-bayes-classifiers/>

**44. Perceptron Algorithm III**

**List 1:**

<https://www.cse.iitb.ac.in/~shivaram/teaching/old/cs344+386-s2017/resources/classnote-1.pdf>

<http://www.cs.columbia.edu/~mccollins/courses/6998-2012/notes/perc.converge.pdf>

**List 2:**

<https://www.youtube.com/watch?v=kObhWlqleD8>

**45. Loss Functions II**

**List 1:**

[https://en.wikipedia.org/wiki/Hinge\\_loss](https://en.wikipedia.org/wiki/Hinge_loss)

[https://en.wikipedia.org/wiki/Cross\\_entropy#Cross-entropy\\_loss\\_function\\_and\\_logistic\\_regression](https://en.wikipedia.org/wiki/Cross_entropy#Cross-entropy_loss_function_and_logistic_regression)

**List 2:**

<https://medium.com/data-science-bootcamp/understand-cross-entropy-loss-in-minutes-9fb263cae9a>

<https://towardsdatascience.com/understanding-binary-cross-entropy-log-loss-a-visual-explanation-a3ac6025181a>

<https://medium.com/analytics-vidhya/understanding-loss-functions-hinge-loss-a0ff112b40a1>

**46. Logistic Regression I**

**List 1:**

<https://kambria.io/blog/logistic-regression-for-machine-learning/>

<https://towardsdatascience.com/introduction-to-logistic-regression-66248243c148>

**List 2:**

<https://machinelearningmastery.com/logistic-regression-for-machine-learning/>

[https://ml-cheatsheet.readthedocs.io/en/latest/logistic\\_regression.html](https://ml-cheatsheet.readthedocs.io/en/latest/logistic_regression.html)