The Evolution of MLE Techniques

- Handling incomplete data

- Addressing bias in estimates

- Application in logistic regression

- **Stochastic Gradient Descent in Deep Learning**

Current Challenges

Bias in small samples or extreme scenarios

Incomplete or missing data
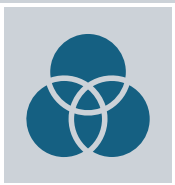
Limitations in complex models

Search Methodology & Criteria

CITATION CHAINING AND FORWARD CITATION

KEYWORD SEARCH

BOOLEAN SEARCH

SNOWBALLING

CRITERIA:

- • Initial review of abstracts to assess relevance based on the title, publication venue, and year.

- • Direct and indirect relevance to the paper being cross-referenced through the abstract.

- • Consideration of the number of citations and field-weighted citation impact (fwci), a metric that measures the citation impact of a paper adjusted for disciplinary differences.

Preliminary Terms

🔑 **Key terms identified during the week:**

- **Maximum Likelihood Estimation (MLE)**
- **Stochastic Gradient Descent (SGD)**
- **Probability Density Function (PDF)**

- **Logistic Regression**
- **Bias**

Document Comparison

"Tutorial on maximum likelihood estimation"

"Bias reduction of maximum likelihood estimates"

"Maximum likelihood estimation of logistic regression models: theory and implementation"

"Recent Advances in Stochastic Gradient Descent in Deep Learning"

References

1. Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood from incomplete data via the EM algorithm. Journal of the Royal Statistical Society: Series B (Methodological), 39(1), 1-22.

2. Firth, D. (1993). Bias reduction of maximum likelihood estimates. Biometrika, 80(1), 27-38.

3. Czepiel, S. A. (2002). Maximum likelihood estimation of logistic regression models: theory and implementation. Available at czep. net/stat/mlelr. pdf.

4. Tian Y, Zhang Y, Zhang H. Recent Advances in Stochastic Gradient Descent in Deep Learning. *Mathematics*. 2023; 11(3):682. https://doi.org/10.3390/math11030682.