# Learning Curve Analysis Methods

- Artificial Intelligence based radiomic model in Craniopharyngiomas: A Systematic Review and Meta-Analysis on Diagnosis, Segmentation, and Classification
- High-resolution vessel wall imaging-driven radiomic analysis for the precision prediction of intracranial aneurysm rupture risk: a promising approach
- Diagnosing migraine from genome-wide genotype data: a machine learning analysis
- Evaluating the Machine Learning Models in Predicting Intensive Care Unit Discharge for Neurosurgical Patients Undergoing Craniotomy: A Big Data Analysis
- Machine learning in prediction of epidermal growth factor receptor status in non-small cell lung cancer brain metastases: a systematic review and meta-analysis
- The establishment of machine learning prognostic prediction models for pineal region tumors based on SEER-A multicenter real-world study
- Host-Microbial Cometabolite Ursodeoxycholic Acid Protects Against Poststroke Cognitive Impairment
- A Spine Surgeon's Learning Curve With the Minimally Invasive L5 to S1 Lateral ALIF Surgical Approach: Perioperative Outcomes and Technical Considerations

---

---

 CUSUM Analysis

 Moving Average Plots

 Regression Analysis

 Time to Task Completion

 Failure Rate Tracking

Regarding Competency-based education in neurosurgery for residents, you want a method that doesn't just show improvement over time, but detects when a resident achieves mastery or consistent performance.

---

 CUSUM Analysis (Cumulative Sum)

 Best suited for competency-based training

Strengths: It detects small shifts in performance and shows when a resident has reached a predefined competency level (e.g., acceptable error rate or success rate).

Highly sensitive to deviations, making it ideal for identifying the transition from novice to competent.

It can be customized per procedure and gives a real-time sense of when a trainee is consistently competent.

 Moving Average Plots Strengths: Good for smoothing out fluctuations and showing general trends.

Limitations: Less precise for pinpointing when competence is reached. Doesn’t account for variation around target performance levels.

□ Regression Analysis Strengths: Shows correlation between experience and performance.

Limitations: More useful for research or group-level trends. Not very actionable for individual assessments in real-time.

□ Time to Task Completion Strengths: Easy to measure and often improves with skill.

Limitations: Speed is not always a good proxy for safety or competency, especially in neurosurgery. Residents might go faster before they're safe.

□ Failure Rate Tracking Strengths: Tracks adverse events or critical failures.

Limitations: Important for patient safety, but not sensitive enough to guide training progression unless combined with another metric.

□ Conclusion: CUSUM is your best pick Why? Because competency-based education is about ensuring residents perform consistently above a set standard, and CUSUM analysis can flag exactly when that happens. It aligns beautifully with milestones and entrustable professional activities (EPAs) in surgical training.

If you're building a framework for assessing neurosurgical residents, consider pairing CUSUM with qualitative feedback and task-specific benchmarks for a robust system.

Would you like a simple CUSUM spreadsheet or Python template tailored for neurosurgery tasks (e.g., ventricular drain placement or aneurysm clip application)?

From:
https://neurosurgerywiki.com/wiki/ - **Neurosurgery Wiki**

Permanent link:
**https://neurosurgerywiki.com/wiki/doku.php?id=learning_curve_analysis_methods**

Last update: **2025/04/29 20:26**