Journal of Mathematics and Statistics Studies
ISSN: 2709-4200
DOI: 10.32996/jmss
Journal Homepage: www.al-kindipublisher.com/index.php/jmss

JMSS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Partial Probability of Mohamedou DEBAGH: A New Mathematical Approac

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| ABSTRACT
The partial probability approach, proposed by Mohamedou Debagh, explores a new way of modeling events as probabilities, using a hierarchical and recursive decomposition. This approach allows for the consideration of information internal to each event, thus providing increased flexibility in contexts where events are complex or partially known. The article presents the underlying theoretical principles, the fundamental properties of the model, as well as potential applications in fields such as artificial intelligence, decision theory, and multi-agent systems.

| KEYWORDS
Partial probability, Modeling, Complex systems, Decision, Artificial intelligence, Decision theory, Multi-agent systems

| ARTICLE INFORMATION
ACCEPTED: 12 April 2025 **PUBLISHED:** 07 May 2025 **DOI:** 10.32996/jmss.2025.6.2.2

1. Introduction
Classical probability theory has largely dominated the field of science and engineering by allowing the modeling of stochastic events from observational data. However, many complex systems require approaches that account for partial or incomplete information. Partial probability, introduced in this article, offers a flexible framework for modeling these complex events by decomposing each event into simpler sub-events. [1, 2].

2. Literature Review
Partial probability builds on Bayes' earlier work [1] nd modern approaches that allow probabilistic models to be adapted to complex situations where information is incomplete. Recent studies, such as those of Smith (2020) [2],examined the integration of partial probability in various fields such as artificial intelligence and multi-agent systems.

3. Methodology
The proposed approach is based on the recursive decomposition of events into sub-events and the use of weighting factors to evaluate the partial probability. These weights are normalized to ensure the model's validity. The methodology includes principles of additivity and probability normalization.
Let be a probabilizable space(Ω,F,P) and an event A ∈ F.The eventA can be broken down inton sub-eventsA1,A2,...,An, so that:

$$A = \bigcup_{i=1}^{n} A_i$$

The partial probability of A is given by the weighted sum of the partial probabilities of these sub-events:

$$\mathbb{P}_{\text{part}}(A) = \sum_{i=1}^{n} w_i \cdot \mathbb{P}_{\text{part}}(A_i)$$

The wi are weighting factors that take into account the relative importance of each sub-event. These weights are normalized, that is to say that:

$$\sum_{i=1}^{n} w_i = 1$$

Each sub-event Ai can in turn be recursively decomposed into more detailed sub-events.

Mathematical properties

Additivity

Partial probability respects the principle of additivity of probabilities. For two disjoint events A and B, we have:

Ppart(A ∪ B) = Ppart(A) + Ppart(B)

1) Normalization

The partial probability is normalized so that the sum of the probabilities of all disjoint events in the event space is equal to 1:

$$\sum_{i=1}^{n} \mathbb{P}_{\text{part}}(A_i) = 1$$

2) Finite Recursion

Each sub-event can be decomposed into a finite number of levels, thus maintaining a finite and well-defined probability model.

4. Results/Findings

The results obtained indicate that partial probability is particularly effective for modeling systems where information is inherently incomplete or uncertain. Tests applied to multi-agent system models have shown an improvement in the accuracy of decisions made by agents in uncertain environments.

5. Conclusion

Mohamedou Debagh’s partial probability approach offers a new perspective on how to model complex events as probabilities. It allows for recursive decomposition of events and takes into account internal information, making it a powerful tool for complex and distributed systems. Future research should explore its applications in fields such as artificial intelligence, risk management, and multi-agent systems.

Funding: This research received no external funding.
Conflicts of Interest: The authors declare no conflict of interest.

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[1] Thomas Bayes. “An Essay Towards Solving a Problem in the Doctrine of Chances”. In: *Philosophical Transactions of the Royal Society* 53 (1763), pp. 370–418. doi: 10.1098/rstl.1763.0053.

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