

## Author Information

### Primary Author and Corresponding Author

**Name:** Haobo Ma

**Institution:** AELF PTE LTD.

**Email:** auric@aelf.io

**ORCID:** 0009-0008-4944-977X

**Role:** Lead Investigator, Theoretical Formulation, Manuscript Writing

**Address for Correspondence:**

#14-02, Marina Bay Financial Centre Tower 1

8 Marina Blvd, Singapore 018981

**Region:** Singapore

### Co-Authors

**Name:** Wen Niu

**Institution:** AELF PTE LTD.

**Email:** ada@aelf.io

**ORCID:** 0009-0006-3349-0298

**Role:** Theoretical Analysis, Manuscript Review

**Address:**

#14-02, Marina Bay Financial Centre Tower 1

8 Marina Blvd, Singapore 018981

**Region:** Singapore

### Author Contributions

Haobo Ma conceived the original concept of information ontology, developed the mathematical formalism, derived the theoretical predictions, designed the verification experiments, analyzed the results, and wrote the manuscript.

Wen Niu contributed to the theoretical analysis, verification of mathematical formalism, and critical review of the manuscript.

### Author Order Rationale

The author order reflects the level of contribution to the theoretical development and manuscript preparation.

### Verification Statement

We, Haobo Ma and Wen Niu, hereby confirm that we have seen and approved the final version of this manuscript and take full responsibility for the integrity and accuracy of all aspects of the work presented.

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