METROLOGIA 2025

150 anos de confiabilidade para um futuro sustentável

Data: 1 a 4 de dezembro de 2025

Local: Centro Cultural e de Exposições Ruth Cardoso

Maceió - AL

Realização

sociedade brasileira de metrologia

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Why Metrology and T4.0 depend on each other

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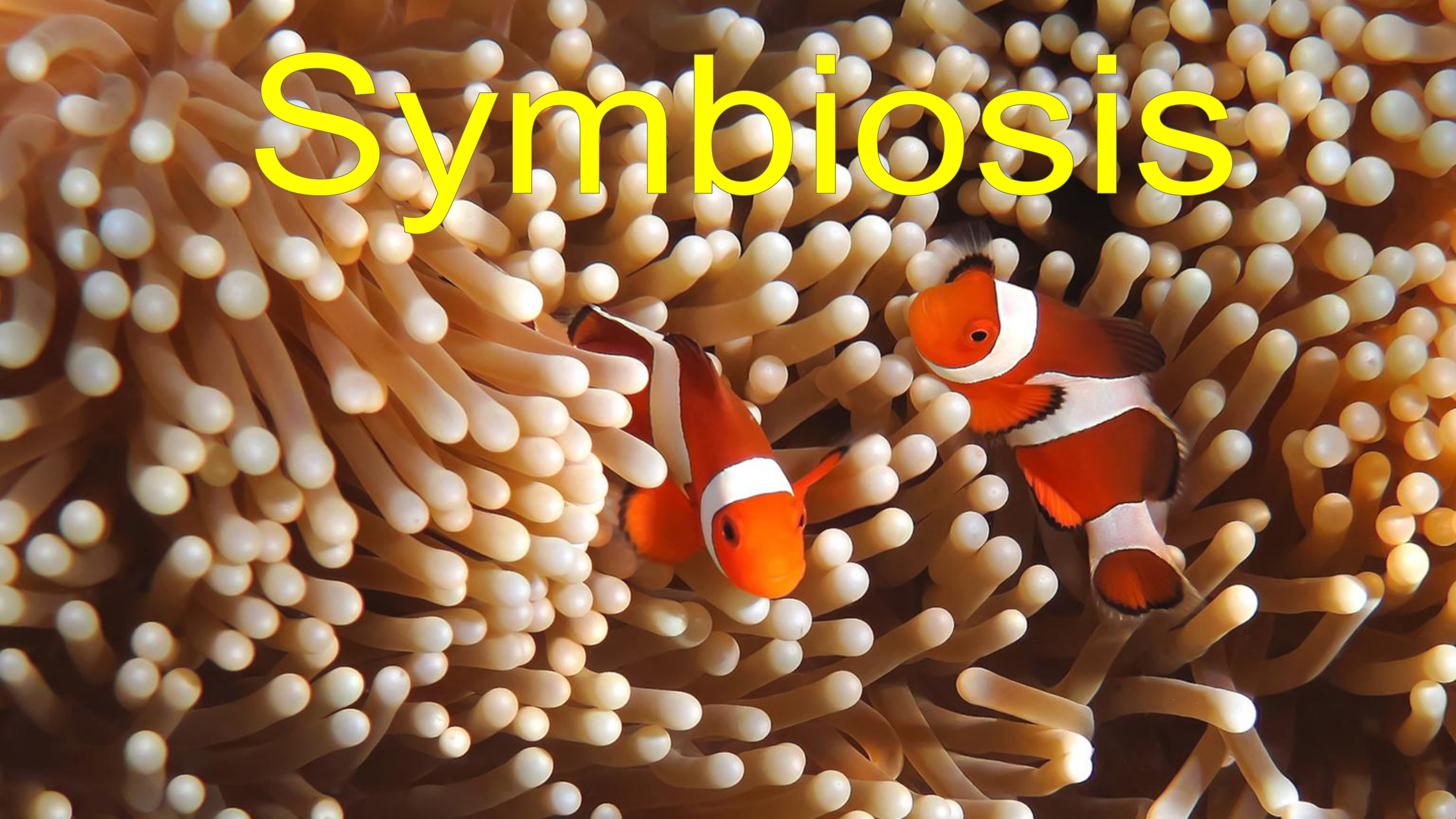
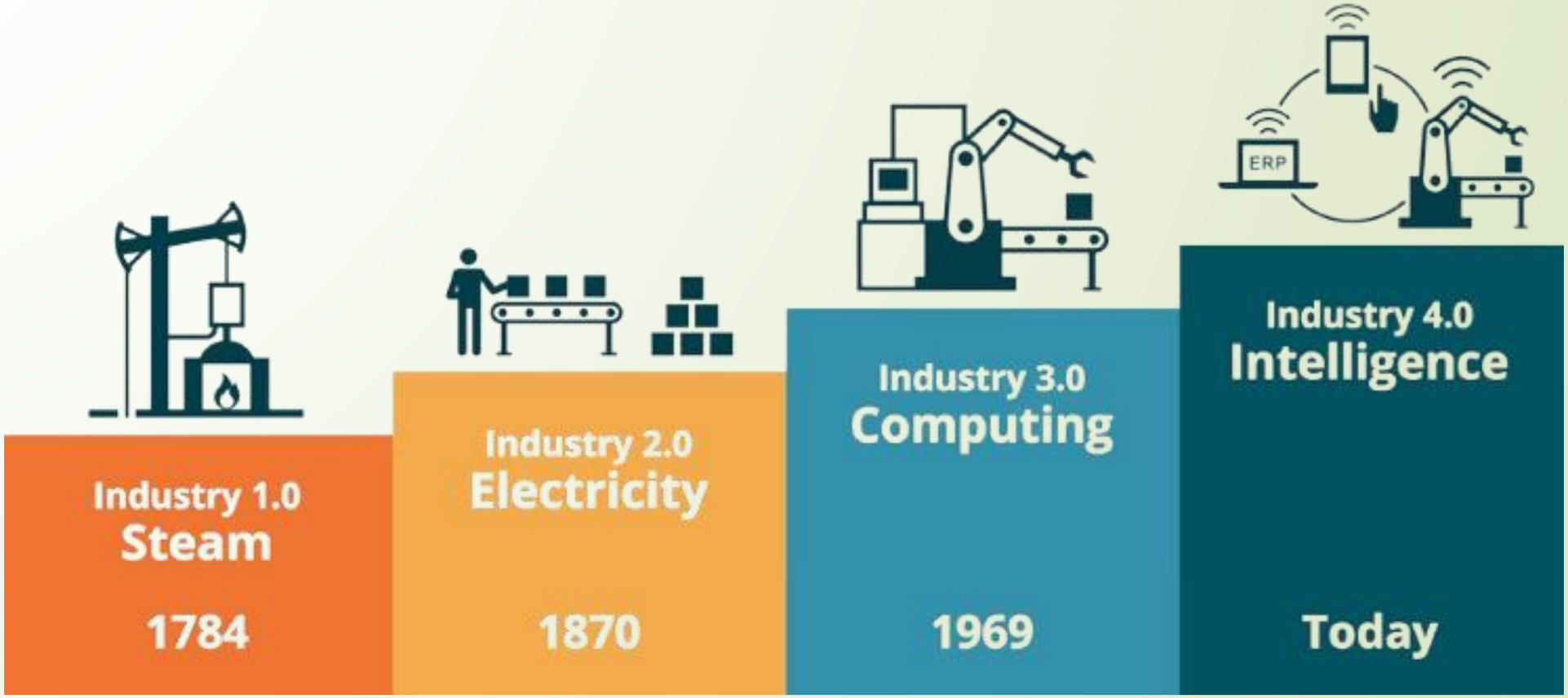
Symbiosis



Digital Transformation is the result of a long revolution



The Digital Transformation Technologies - T4.0

- Data-driven, exponential technologies
- Not only the industry!
- The whole civilization is absorbing those technologies in most activities
  - health
  - mobility
  - energy
  - home
  - entertainment
  - relationships

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Metrology

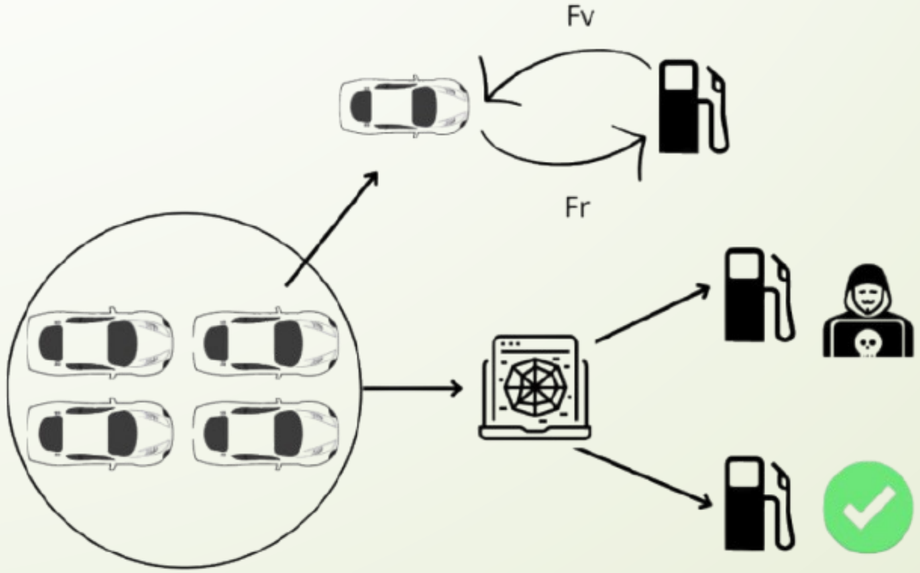
Are they different knowledge cores, and consequently distinct things?

Not the best option, since they need each other so much!

T4.0

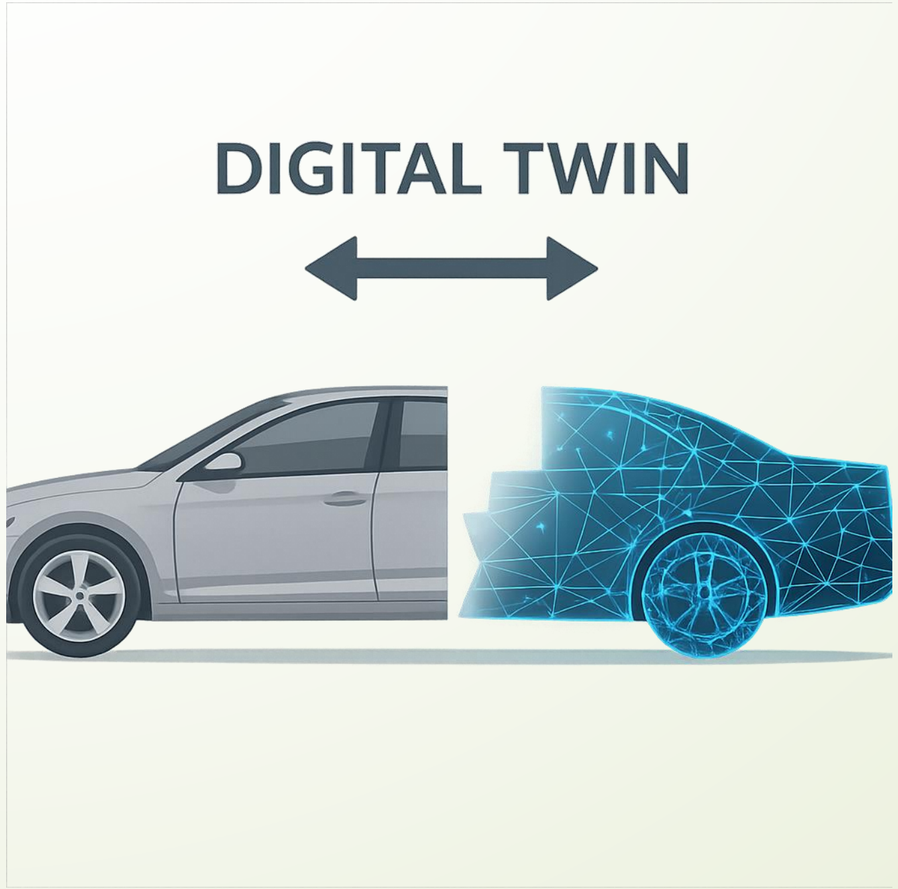
An example about how T4.0 can help Metrology

- **Fuel pumps** are a big challenge for Legal Metrology in Brazil, also in many developing countries
  - Too **many devices** spreaded around the country
  - **Fraud** can become a disseminated practice
  - Conventional **surveillance is not enough** anymore



- **T4.0** gives us an alternative by using **data-driven measurement** verification
  - Vehicles use **IoT** to inform the fuel amount refilled
  - If **many vehicles refill in the same pump**, we can apply the **Law of Large Number** to estimate its measurement uncertainty
  - **AI helps providing decision** about possible frauds

But T4.0 also depend on Metrology help



- **Next step:** build a vehicular **digital twin** for energy efficiency
  - The model **learns from data instrumentation** on regular day-by-day real driving conditions
  - The **predicted energy efficiency** can determine fraud suspicious scenarios

- But, how **can we use data for training without considering the measurement uncertainty?**
  - How can I decide if **a dataset is good or bad**?
  - AI models need desperately on data uncertainty evaluation
  - T4.0 need **Metrology come to rescue**!

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Metrology 4.0

AGRADECEMOS SUA PRESENÇA

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