AI/ML as a Key Enabler of 6G Networks

AI/ML Input/Output Data & Conclusions

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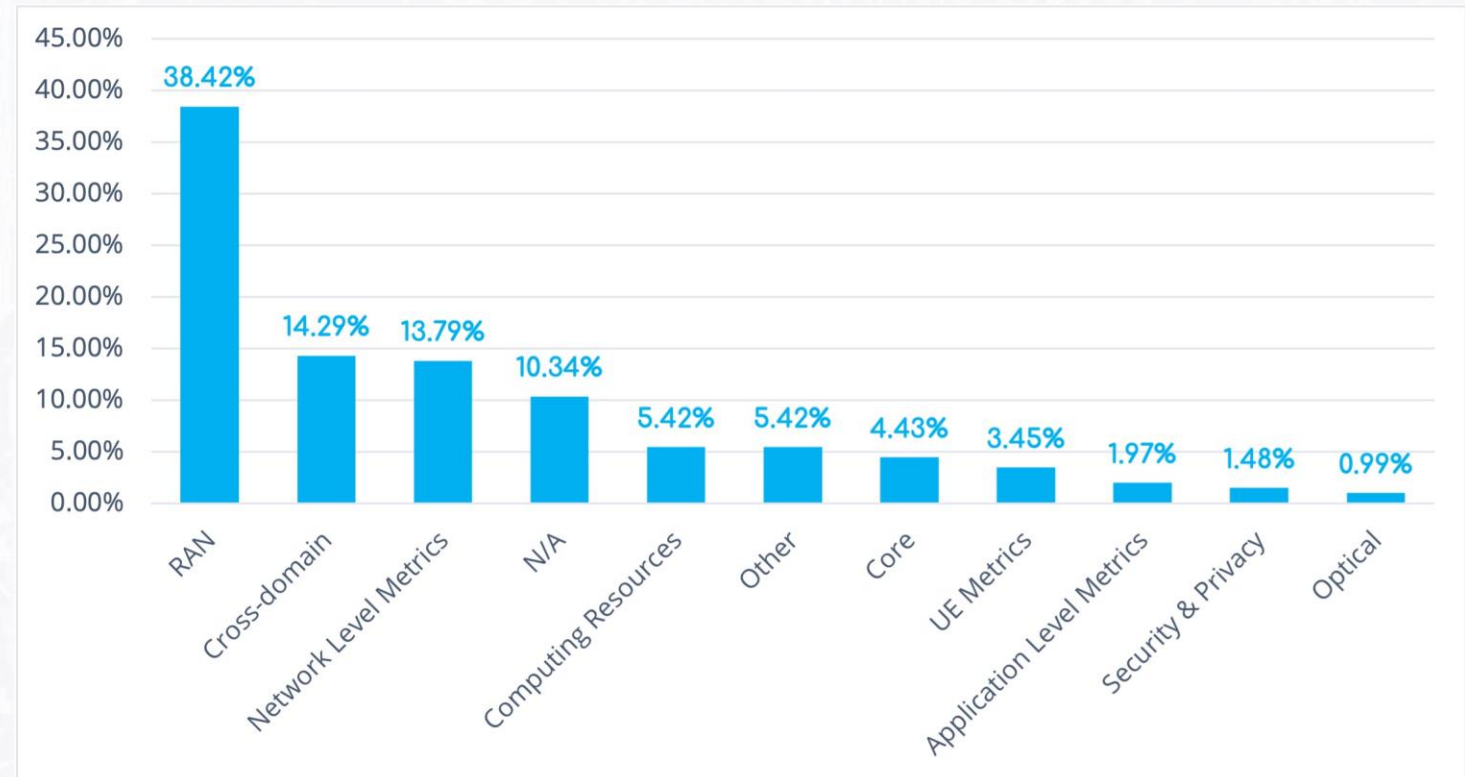
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AI/ML Training Data (Section 6.2)

- **Mapping process conducted** to classify input data sources.
- **Categories defined** based on data origin and nature.
- **Key categories**: RAN, network metrics, computing resources, core, and UE metrics.
- **Additional categories**: Application-level data, security, cross-domain inputs, and optical metrics.
- **Full definitions** available in the white paper (Table 2)

Data Category	Definition
Radio Access Network (RAN)	Data related to radio measurements
Network Level Metrics	Aggregated traffic data, packet-level statistics
Computing Resources	Metrics associated with CPU and RAM utilization
Core	Information originating from central network elements
UE Metrics	Data that directly represent user-level conditions
Application-Level Metrics	Data collected at the application level
Security & Privacy	Datasets and indicators related to attack detection
Cross-domain	Inputs may cover more than one domain
Optical	Optical-layer metrics
Other	Any input that does not readily fit into the previous categories
N/A	No information was provided

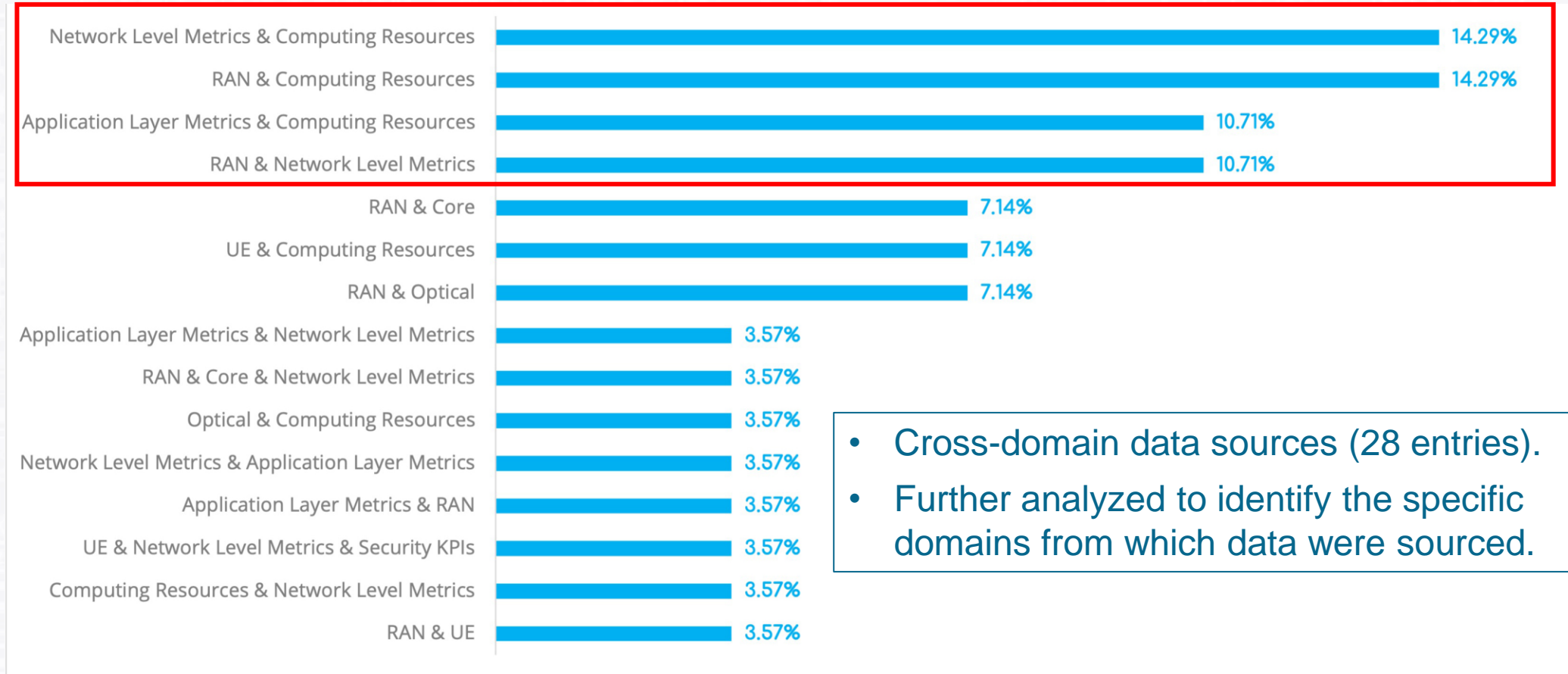*AI/ML White Paper, Section 6.2, Summarized Version of Table 2*

AI/ML Training Data Distribution

- **The Figure** shows the distribution of training data sources.

- **RAN-related inputs** lead with 38.42% of responses.

- **Cross-domain inputs** follow at 14.29%, reflecting multi-domain integration.

- **Network-level metrics** account for 13.79%, with computing resources also present (5.42%).

- **Optical and security inputs** appear less frequently, tied to specialized use cases.

AI/ML White Paper, Section 6.2, Figure 22

AI/ML Training Data Distribution: Cross-domain Category

Chart: Cross-domain Category data distribution

Category	Percentage
Network Level Metrics & Computing Resources	14.29%
RAN & Computing Resources	14.29%
Application Layer Metrics & Computing Resources	10.71%
RAN & Network Level Metrics	10.71%
RAN & Core	7.14%
UE & Computing Resources	7.14%
RAN & Optical	7.14%
Application Layer Metrics & Network Level Metrics	3.57%
RAN & Core & Network Level Metrics	3.57%
Optical & Computing Resources	3.57%
Network Level Metrics & Application Layer Metrics	3.57%
Application Layer Metrics & RAN	3.57%
UE & Network Level Metrics & Security KPIs	3.57%
Computing Resources & Network Level Metrics	3.57%
RAN & UE	3.57%

- Cross-domain data sources (28 entries).
- Further analyzed to identify the specific domains from which data were sourced.

AI/ML White Paper, Section 6.2, Figure 23

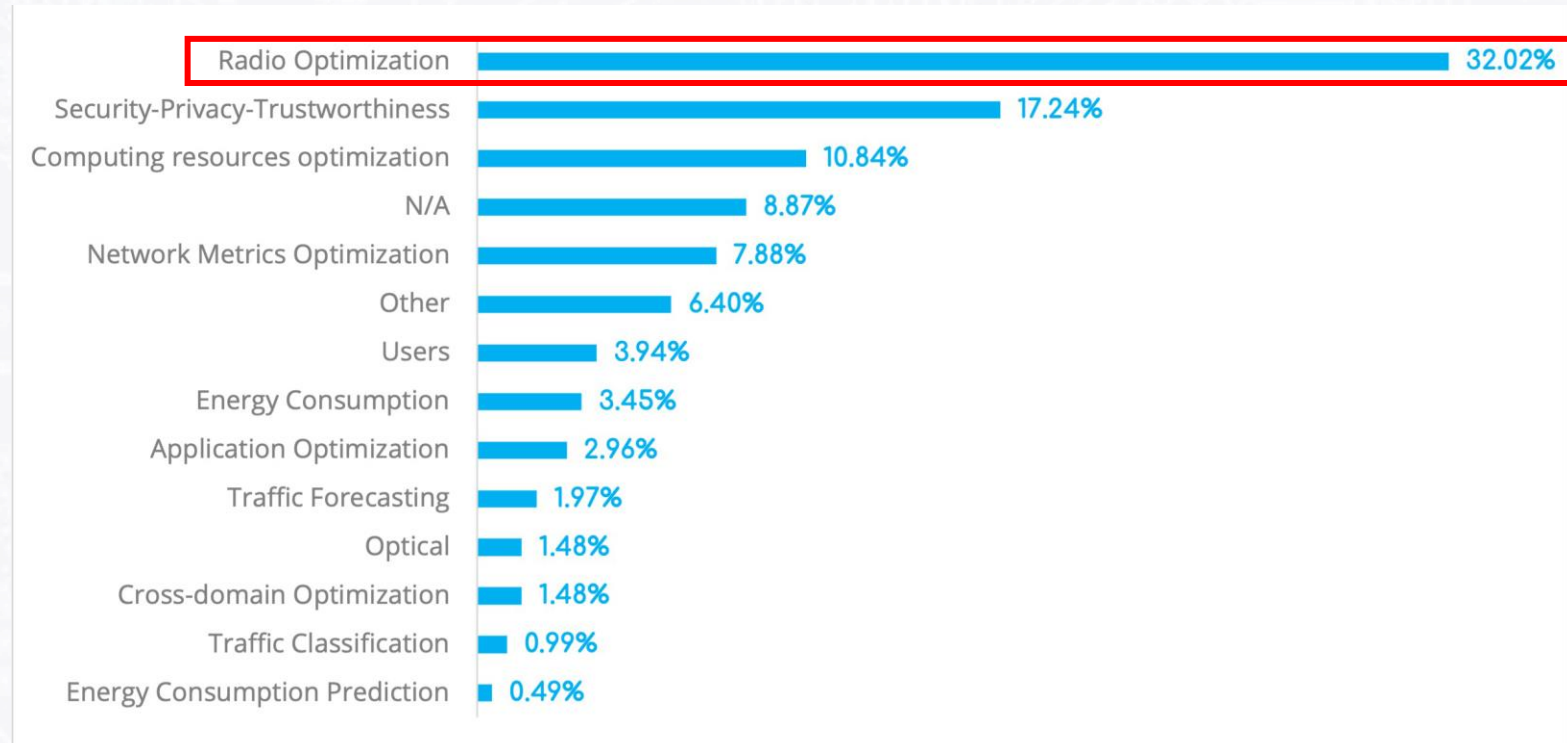# Output Data by AI/ML Mechanisms (Section 6.3)

6GSNS

- **Investigated AI output data** alongside input data analysis.
- **Mapping process** conducted to categorize outputs.
- **Full definitions** available at Table 3 of the AI/ML White Paper.

Data Category	Definition
Radio Optimization	Improving the operations of radio networks.
Computing Resources Optimization	Improve CPU or RAM usage, or VM operations, or more efficient VNF placement.
Network-Level Optimization	Predict throughput and latency, or enhance link utilization.
Energy Efficiency Optimization	Reduce energy consumption.
Traffic Forecasting	Predict future traffic demands.
Traffic Classification	Classify traffic types.
Application-Level Optimization	Improve what applications deliver to the end user.
User-Level Metrics	Improve user-centric data.
Security-Privacy-Trustworthiness	Detect and/or respond to attacks.
Optical Optimization	Improve optical signals and related parameters.
Cross-domain Optimization	Act on multiple domains, e.g., joint RAN-Core configuration.
Other	Outputs that do not fall under the previous categories.
N/A	No information was provided.

AI/ML White Paper, Section 6.3, Summarized Version of Table 3

Output Data by AI/ML Mechanisms Distribution

6GSNS

- **Radio Optimization** leads the AI/ML outputs (32.02%).

- **Other key areas**: Security-Privacy-Trustworthiness (17.24%) and Computing Resources Optimization (10.84%).

- **Diverse AI/ML outputs** span multiple domains, with niche areas including Energy Consumption Prediction and Traffic Classification.

Mechanism	Percentage
Radio Optimization	32.02%
Security-Privacy-Trustworthiness	17.24%
Computing resources optimization	10.84%
N/A	8.87%
Network Metrics Optimization	7.88%
Other	6.40%
Users	3.94%
Energy Consumption	3.45%
Application Optimization	2.96%
Traffic Forecasting	1.97%
Optical	1.48%
Cross-domain Optimization	1.48%
Traffic Classification	0.99%
Energy Consumption Prediction	0.49%

Conclusions (Opportunities & Way Forward)

- First step towards systematically tracking AI-enabled mechanisms within SNS JU.

- Foundation for **benchmarking**: Support future validation efforts to refine AI research outputs in Europe.

- Draw the roadmap for future AI research within the SNS JU:

  - Promote data-sharing agreements across public and private entities to improve access to real-world datasets.

  - Invest in advanced AI techniques, promote privacy, robustness, and reliability of AI systems.

  - Contribute to standardization for 6G.