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Advanced Deep Learning and Kernel Methods

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September 24, 2025

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Preface

- **Kernel Methods**
- **Neural Tangent Kernel and Neural Networks**
- **Biologically inspired ANNs for Visual Cortex**
- **Geometric Deep Learning**
- **Adversarial Attacks and ANNs Implicit Bias**

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1 Kernel Methods

1.1 Math of Kernels

1.1.1 Aronszajn's Theorem

(Aronszajn 1950) K is a p.d. kernel on the set $\mathscr{X}$ **if and only if** there exists a Hilbert space $\mathscr{H}$ and a map $\phi : \mathscr{X} \to \mathscr{H}$ such that

$$K(x,x') = \langle \phi(x), \phi(x') \rangle_{\mathscr{H}} \quad \forall x,x' \in \mathscr{X}$$

where $\langle \cdot, \cdot \rangle_{\mathscr{H}}$ is the inner product in $\mathscr{H}$.

Bibliography

[1] David Goldberg. “What every computer scientist should know about floating-point arithmetic”. In: *ACM computing surveys (CSUR)* 23.1 (1991), pp. 5–48.

[2] *High Performance Computing — digital-strategy.ec.europa.eu*. https://digital-strategy.ec.europa.eu/en/policies/high-performance-computing.