Developmental Robotics

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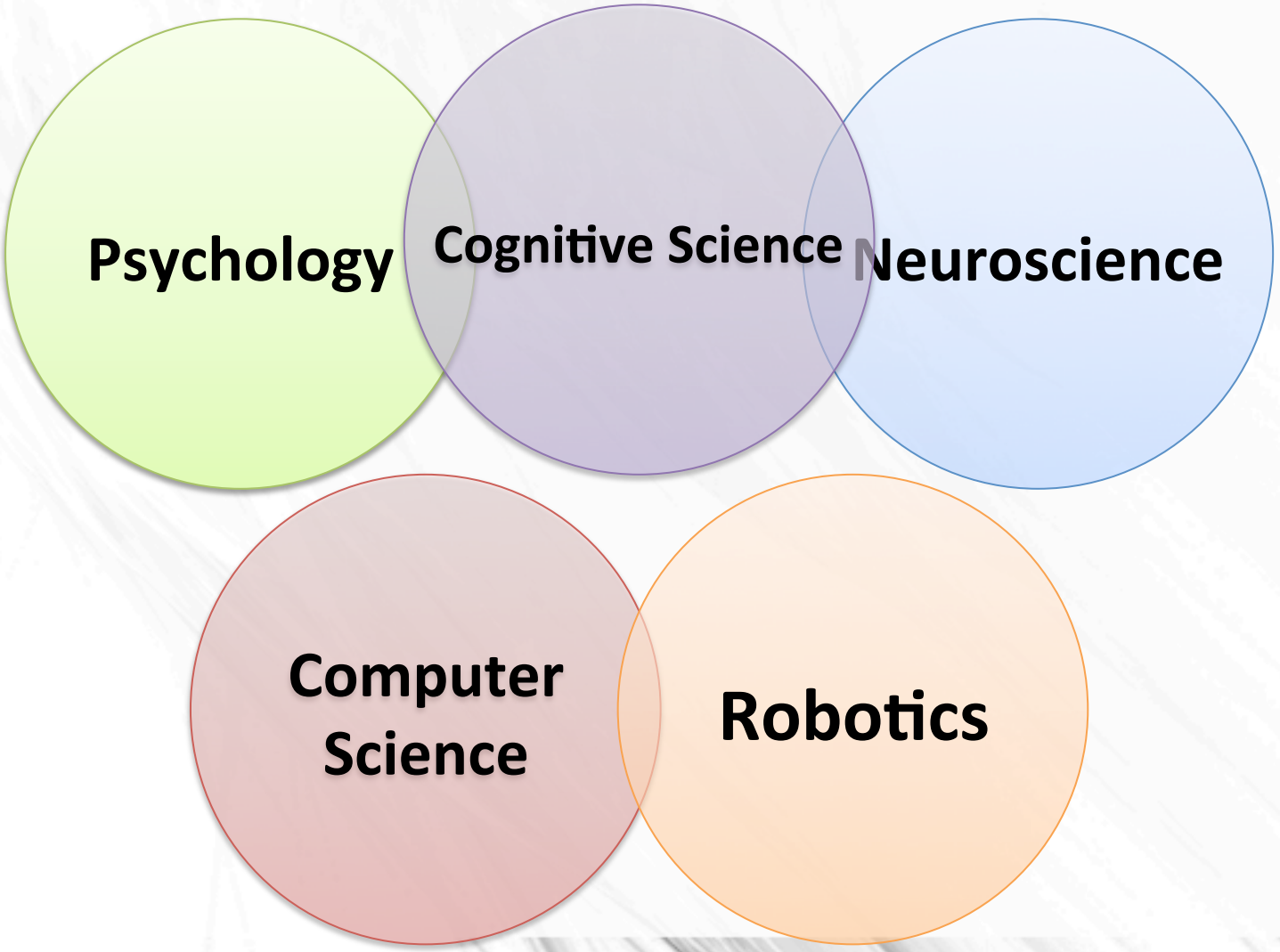
What is it about?

- Creating *intelligent embodied robots* by allowing them to go through a developmental process
- Investigation of initial *control architecture* and *adaptive mechanisms*
- Focuses on the autonomous *self-organization* of general-purpose, *task nonspecific* control systems

Two-fold Mission

- Building machines capable of learning in interaction with humans
- Better understanding human development

Multi-disciplinary



Facets of Development

Facet	Synopsis
Incremental process	Prior structures and functions are necessary to bootstrap later structures and functions
Importance of constraints	Early constraints can lead to an increase of the adaptivity of a developing organism
Self-organizing process	Development and learning are not determined by innate mechanisms alone
Degrees of freedom	Constraining the movement space may be beneficial for the emergence of well coordinated and precise movements
Self-exploration	Self-acquired control of body dynamics
Spontaneous activity	Spontaneous exploratory movements are important precursors of motor control in early infancy
Prospective control, early abilities	Predictive control is a basic early competency on top of which human cognition is built

Facets of Development

Facet	Synopsis
Categorization, sensorimotor coordination	Categorization is a fundamental ability and can be conceptualized as a sensorimotor interaction with the environment
Value systems	Value systems mediate environ- mental saliency and modulate learning in a self-supervised and self-organized manner
Social interaction	Interaction with adults and peers is very important for cognitive development

Principles of DevRob

- Verification
- Embodiment
- Subjectivity
- Grounding
- Incremental Developing

Publications

- IEEE Computational Intelligence Society
  - IEEE Transactions on Autonomous Mental Development
  - AMD Newsletter

Main Conferences

- The International Conference on Development and Learning
- International Conference on Epigenetic Robotics
- IEEE ICDL/EpiRob

Past Events

- ICDL-EpiRob 2011, Frankfurt, Germany
- ICDL10, Ann Arbor, USA
- ICDL09, Shanghai, China
- ICDL08, Monterey, USA
- ICDL07, London, UK
- ICDL06, Bloomington, USA
- ICDL05, Osaka, Japan
- ICDL04, San Diego, USA
- ICDL02, Cambridge, USA
- WDL00, East Lansing, USA

- EpiRob10, Örenäs Slott, Sweden
- EpiRob09, Venice, Italy
- EpiRob08, Brighton, UK
- EpiRob07, Piscataway, NJ, USA
- EpiRob06, Paris, France
- EpiRob05, Nara, Japan
- EpiRob04, Genoa, Italy
- EpiRob03, Boston, MA, USA
- EpiRob02, Edinburgh, Scotland
- EpiRob01, Lund, Sweden

Related Journals and Conf.

- Psychological Review
- Connection science
- Int. Journal of Humanoid Robotic
- Artificial Life
- Robotics and Autonomous Systems
- IEEE Trans. on Systems, Man and Cybernetics

Related Journals and Conf.

- IEEE World Congress on Computational Intelligence (WCCI)
- Cognitive Science Society Conf.
- Int. Conf. on Intelligent Robots and Systems (IROS)
- IEEE Int. Conf. on Robotics and Automation (ICRA)
- Simulation and Adaptive Behavior

Related Journals and Conf.

- Int. Conf. on Algorithmic Learning Theory
- Int. Conf. on Machine Learning (ICML)
- Artificial Life and Robotics Conf. (AROB)
- Cybernetics and Systems

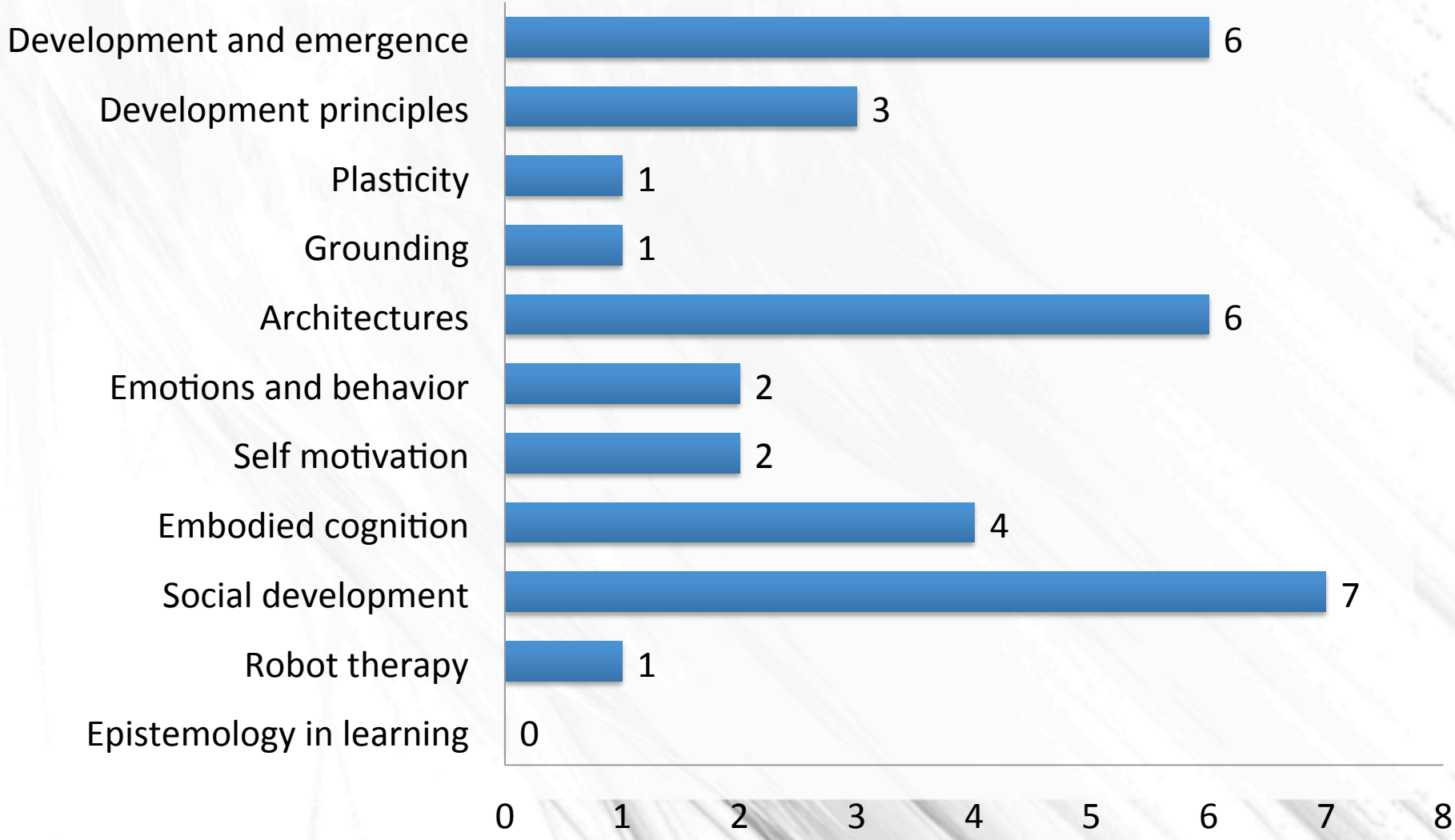
Topics ICDL-EpiRob, 2012

- The science and engineering of learning.
- Machine learning and development.
- Sensory motor control.
- Computational approaches to the study of development and learning.
- Neural basis of development and learning.
- Language Acquisition.
- Neurogenesis.

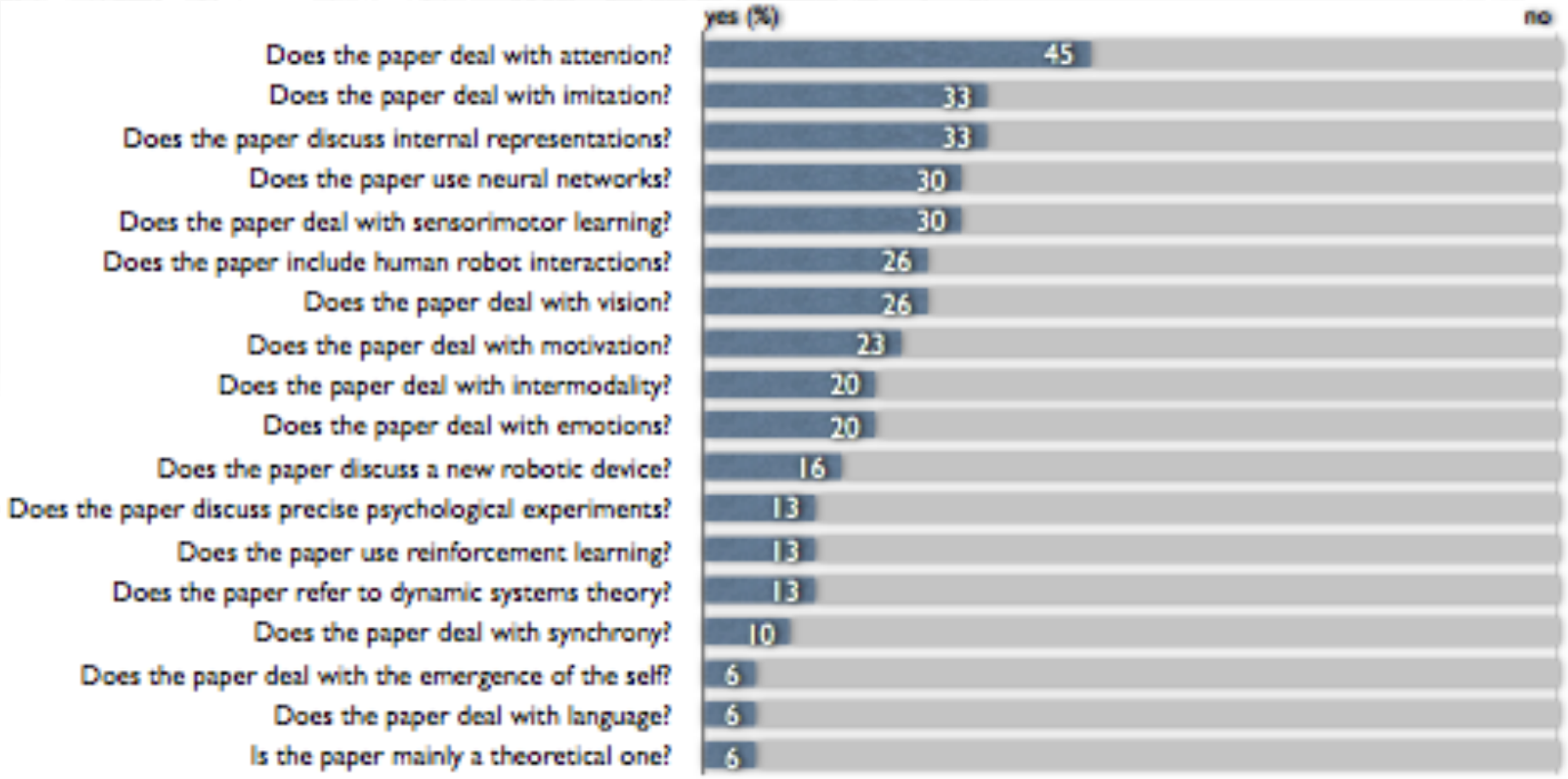
Topics ICDL-EpiRob, 2012

- Datasets for the Analysis of Learning and Development.
- Field Studies.
- Biomimetic robots.
- Affect, Development and Learning.
- Intrinsic motivation, exploration and play
- Social development in humans and robots.
- Applications to education and clinical interventions.

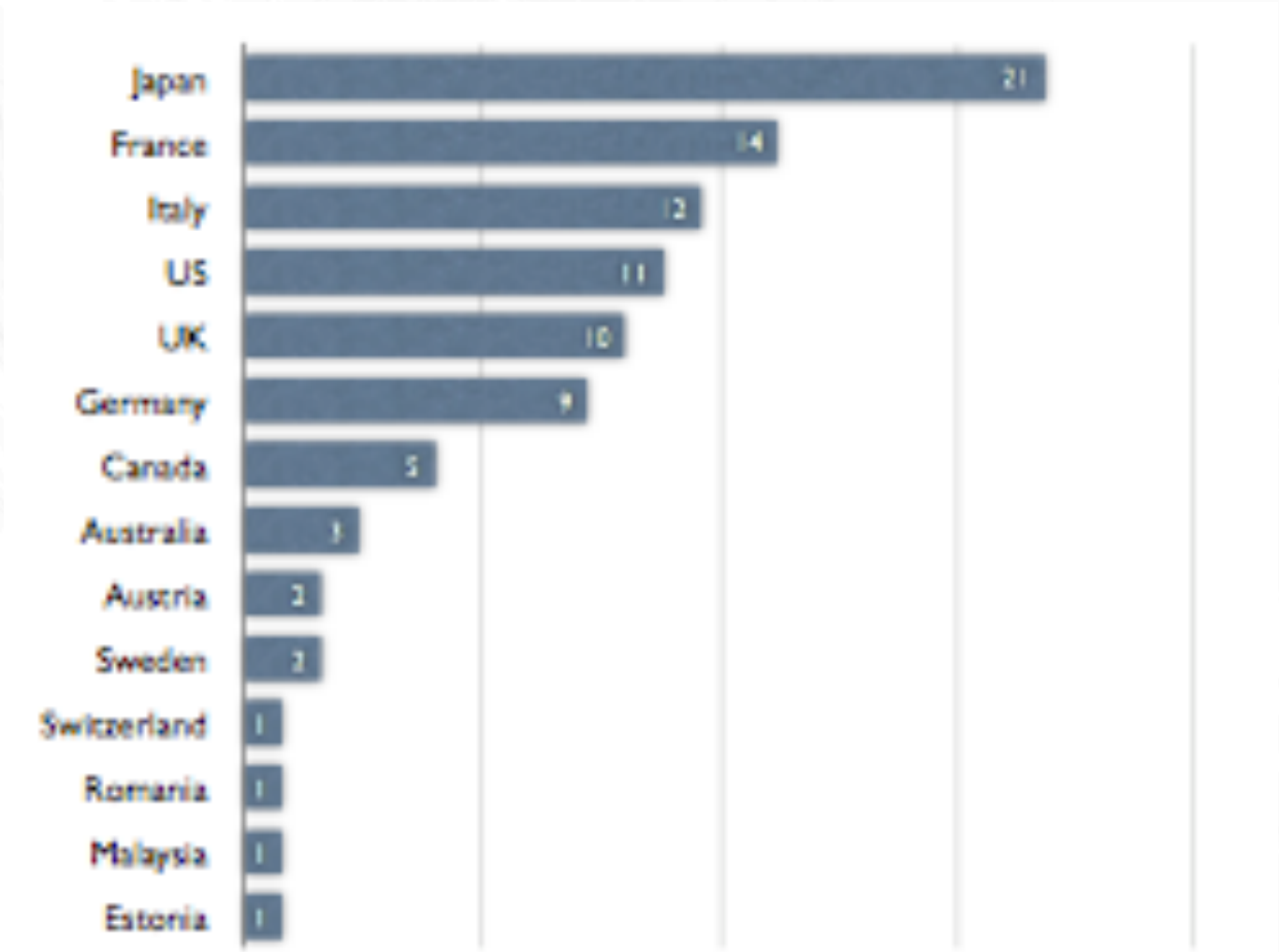
ICDL/EpiRob 2011



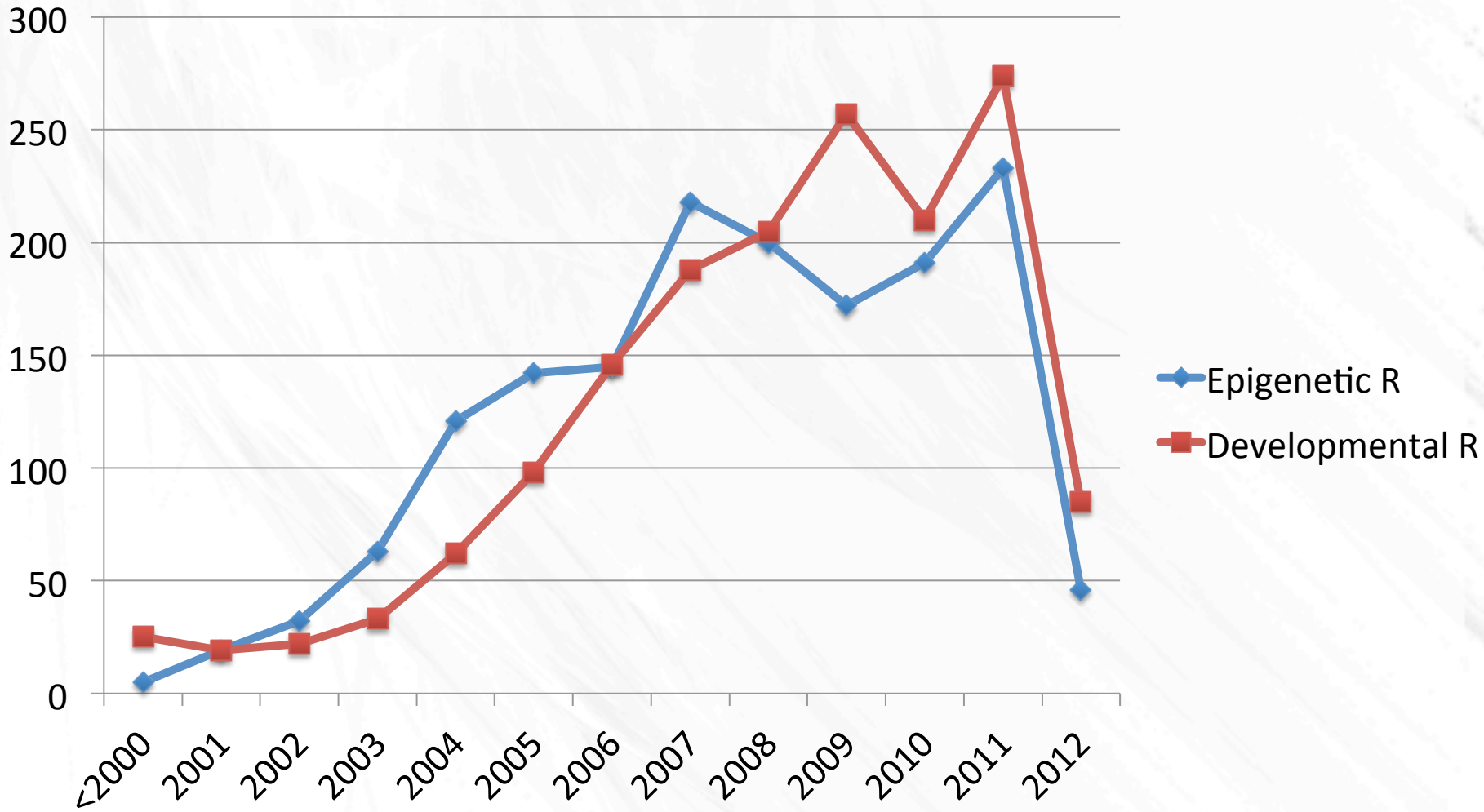
Topics in EpiRob 2006



Geographical Distribution

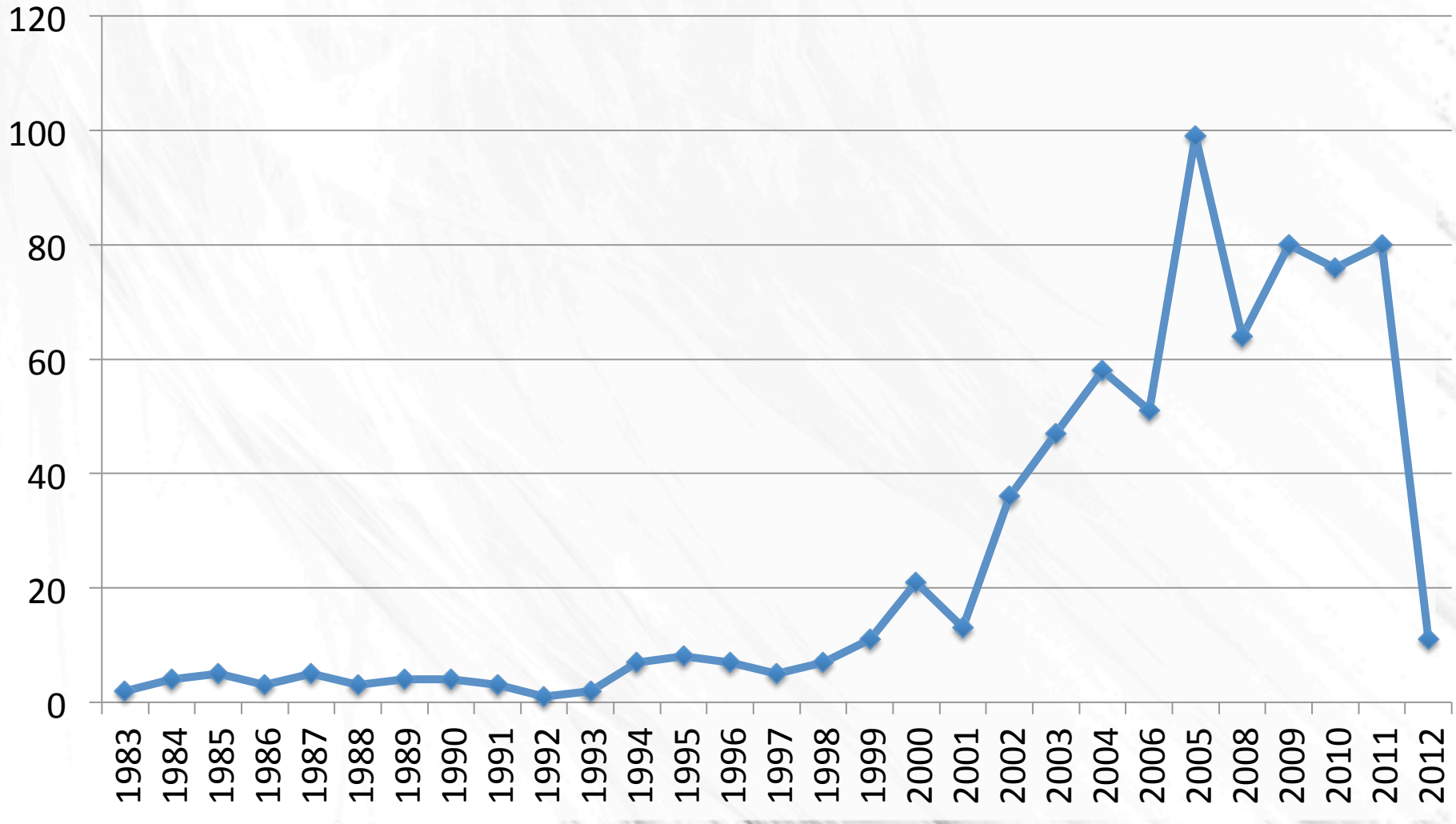


Trend Acc. Google Scholar

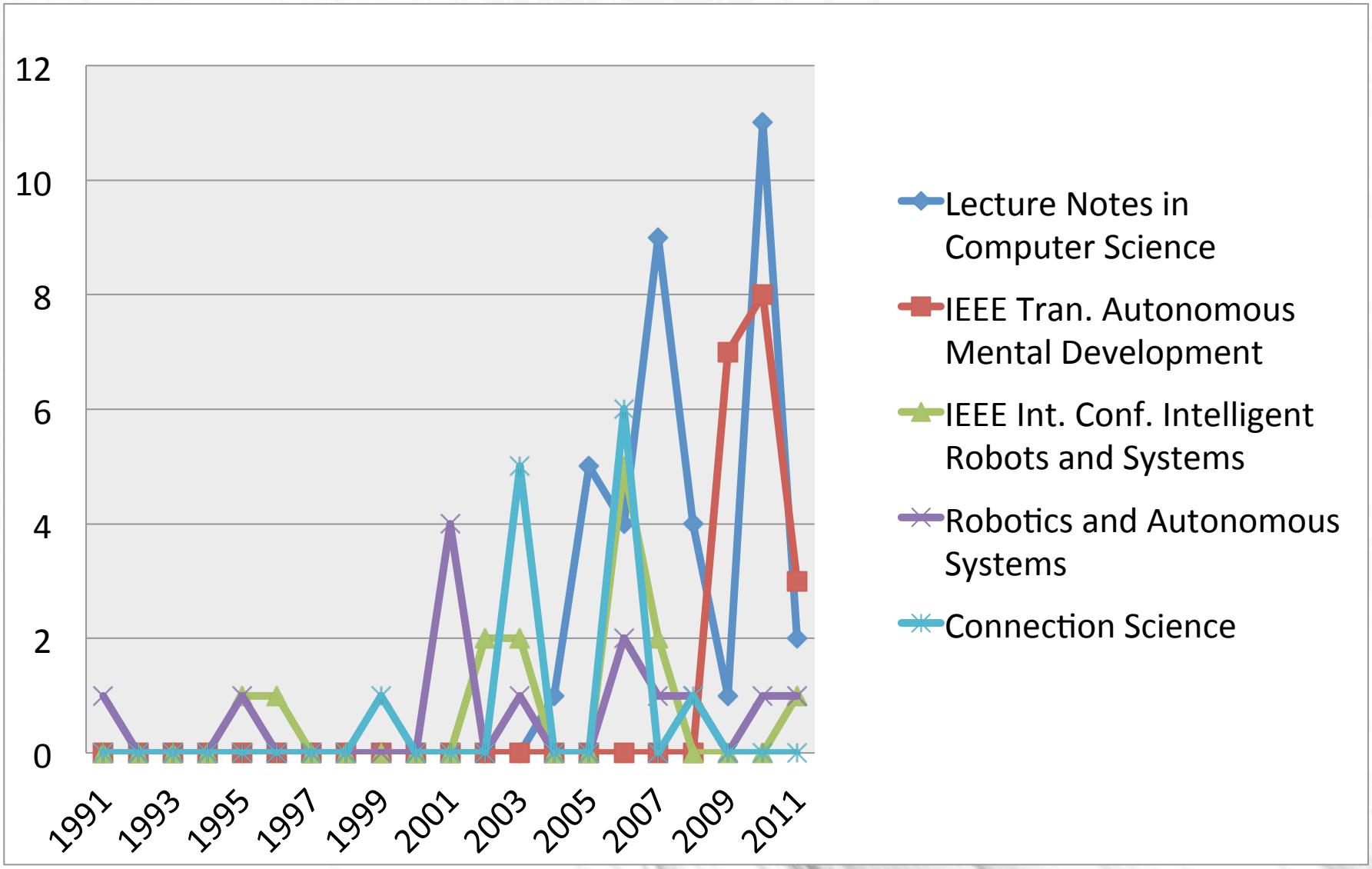


Scopus Database

Developmental or Epigenetic Robotics



Publications



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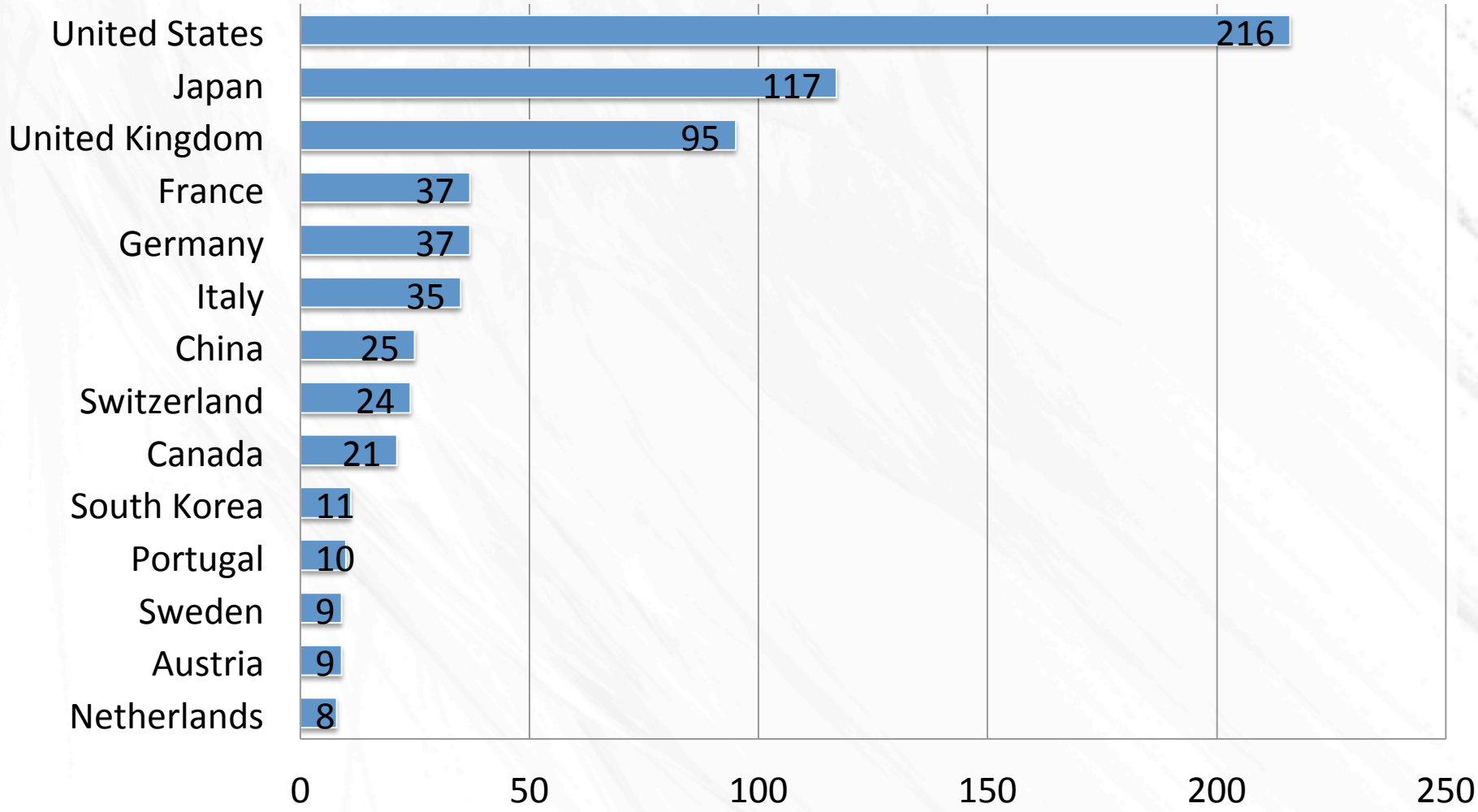
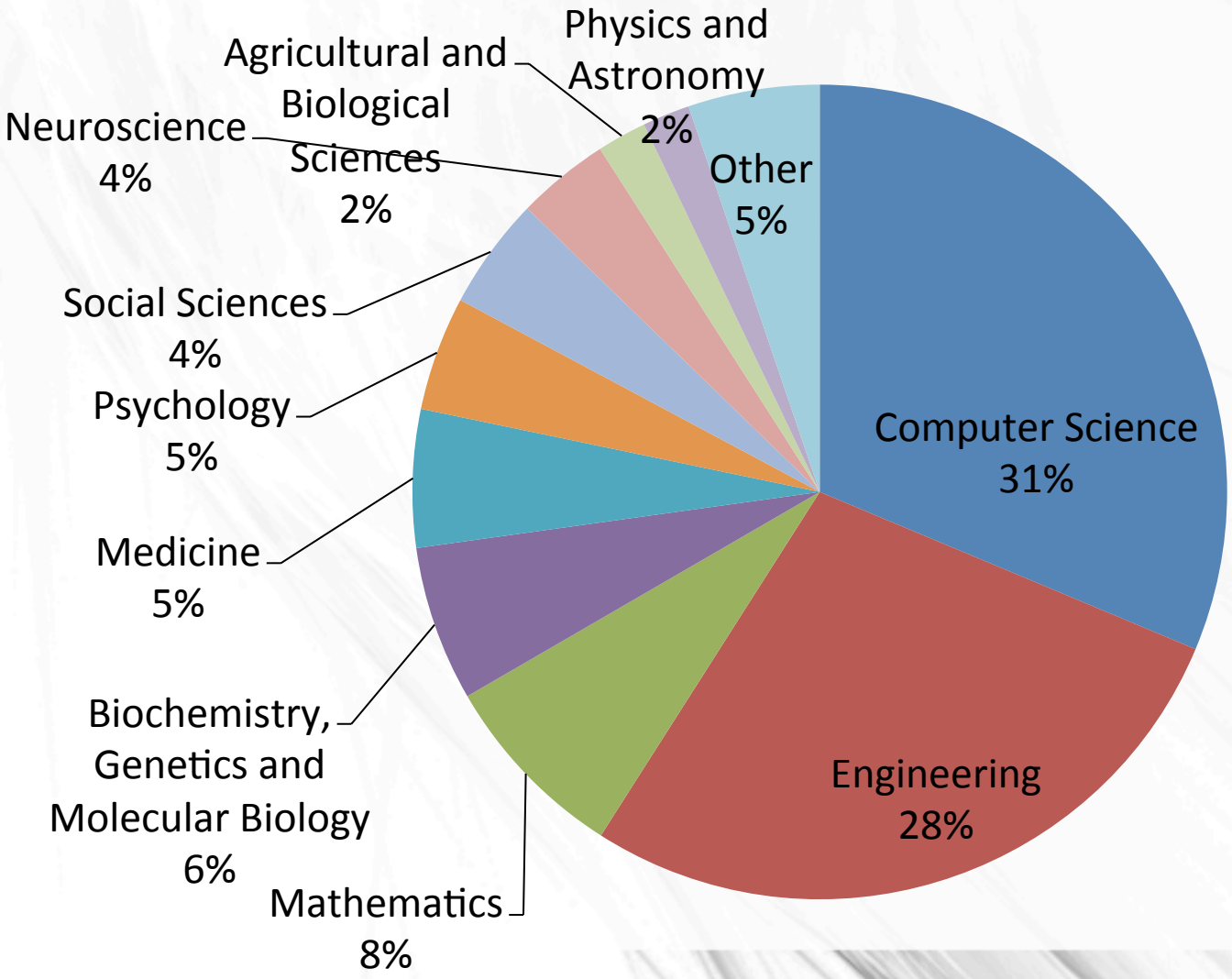


Subject Area



Most-cited Papers

- Breazeal C., “Emotion and sociable humanoid robots,” Int. J. Human Computer Studies, 2003
- Asada M., MacDorman K.F., Ishiguro H., Kuniyoshi Y., “Cognitive developmental robotics as a new paradigm for the design of humanoid robots,” Robotics and Autonomous Systems, 2001
- Lungarella M., Metta G., Pfeifer R., Sandini G., “Developmental robotics: A survey,” Connection Science, 2003
- Oudeyer P.-Y., Kaplan F., Hafner V.V., “Intrinsic motivation systems for autonomous mental development,” IEEE Tran. Evolutionary Computation, 2007

Thank you!