Piscimetrics II[$]: Neural network models in fisheries research

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Dedicated to Dr (Emeritus Professor) Antonio Braibanti, Department of Food and Drug, University of Parma, Italy who lived 95years on the lap of Mother Earth

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ABSTRACT

eXPisciMetrics (i.e. evolving + Xplanatory+ Pisci+metrics; or in general eX$$$Metrics) had been a sought after high-end-frame-of-tools(Heft) in computational science (CS) during past two decades in fisheries research. The studies are moving forward to shed more light with state-of-knowledge-of-instrumentation, large databases, output of knowledge/intelligence extraction tools, deep learning (with attention/self-attention) of I/O mapping with hierarchical/parallel/sequential neural nets, capsule (vector/ matrix) nets, GenerativeAdversarial Networks (GANs), transformer-NNs classical/ advanced machine learning tool-box of methods, functional (operator-valued kernel based) generalization of Nets, and nets in net (NiN), controlled by total quality assurance (TqA) with metro-metrics-measures(MCube) adhering to DARPA/NSF (USA) and European/Japanese agenda of target standards.

*   The application fields of research in fisheries covered in this review include recruitment/ settlement/distribution of fish species, their detection, re-identification and confirming micro-fossil fish teeth. The fore-casting of catches, classification (order, family/species) /discriminationof different varieties of live fish from dead-eggs, bio-mass, CPUE, and fish assessment index were studied with NN-architectures. The freshness, concentration of toxins, shelf-life, separation of healthy from unhealthy ones, segmentation of fish skin and mortality have been investigated. Fish appetite, feeding intensity, feed-in take was reported using advanced NN models. The fishing operations, closures, management paved way for planning potential economic fishery zones. The complex tasks like shrimp egg counting, arriving at day-light images of fish from those under various intensities and sonar signals are investigated with CNNs, DeepNNs etc. The design of futuristic fisheries research programs will be benefitted by rational/scientific xAI and Hierarchical-knowledge-based-machine learning as well as Deep-architectures with capsules-of -neurons as processing units making use of tensorial-fusion-data structures and ensemble-methods for robust output.*

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[$]Part 1: Neural network models in fisheries research (Review), Fisheries Research 92 (2008) 115–139, Iragavarapu Suryanarayana, Antonio Braibanti, Rupenaguntla Sambasiva Rao, Veluri Anantha Ramam, Duvvuri Sudarsan, Gollapalli Nageswara Rao.

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