**Tutorial on generative artificial intelligence**

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**Abstract**

**1. Introduction to GenAI**

By informal statement, generative artificial intelligence (GenAI) applications aim to reproduce original artifacts such as images, sounds, music, texts, and speeches into a new artifact with some changes. The problem is that reproduction or generation, which is not duplication, indeed derives a new piece of content which is large or small from whole content of the original artifacts. For example, given a smiling face of a specific person, GenAI application will generate a crying face of the same person. Within general case, GenAI can reproduce a new human face from a set of original human faces. Therefore, GenAI must recognize and preserve some features (extracted / known by computer programs) which are representations of these contents in real world. Obviously, the recognition is performed implicitly or explicitly by GenAI and so, reproduction and recognition are two combined aspects of GenAI. Focusing the reproduction as well as generation ability without taking notice of recognition ability can cause an unintentional mistake in understanding GenAI although generation ability as well as generative models will be described mainly in this report.

**2. Generative models**

**3. Language models**

**4. Discussions**

**References**