Machine Learning and the Future of Work

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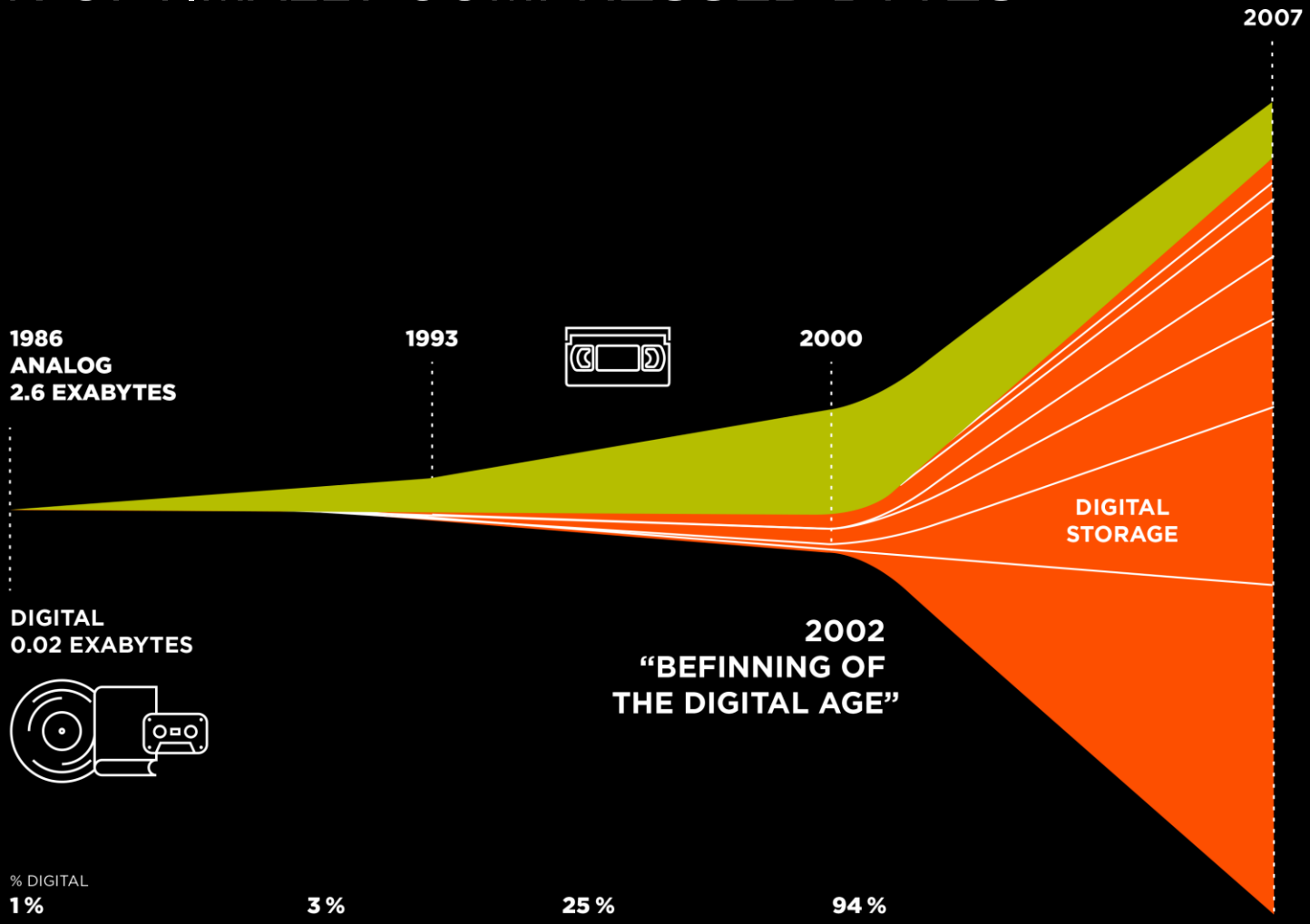
@lawrennd

GLOBAL INFORMATION STORAGE CAPACITY
IN OPTIMALLY COMPRESSED BYTES



ANALOG
19 EXABYTES
- Paper, film, audiotape and vinyl: 6%
- Analog videotapes (VHS, etc): 94%

ANALOG

DIGITAL

- Portable media, flash drives: 2%
- Portable hard disks: 2.4%
- CDs & Minidisks: 6.8%

- Computer Servers and Mainframes: 8.9%

- Digital Tape: 11.8%

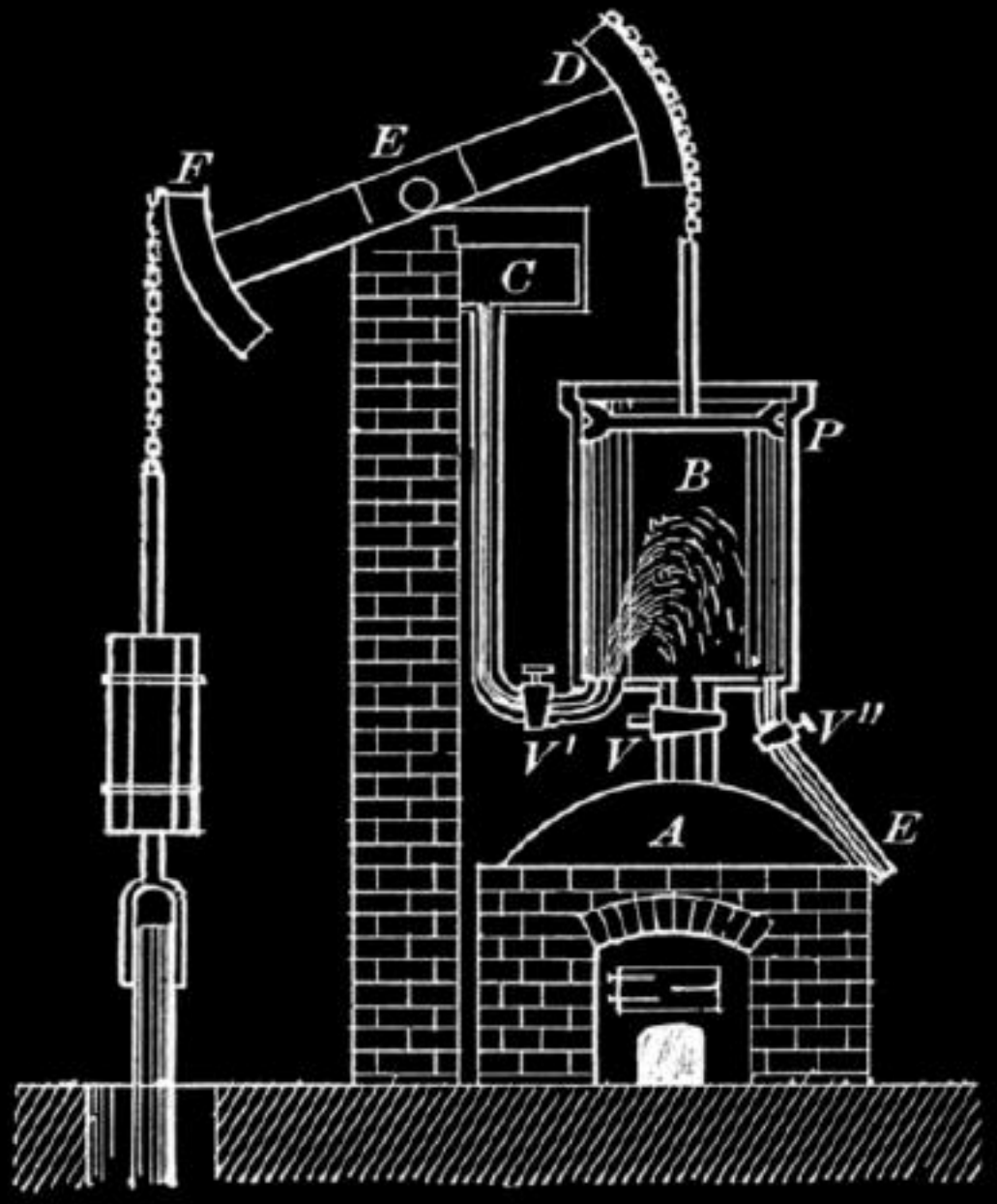
- DVD/Blu-Ray: 22.8%

- PC Hard Disks: 44.5%
  123 Billion Gigabytes

- Others: < 1% (incl. Chip Cards, Memory Cards, Floppy Disks, Mobile Phones, PDAs, Cameras/Camcorders, Video Games)

DIGITAL
280 EXABYTES

Source: Hilbert, M., & López, P. (2011). The World's Technological Capacity to Store, Communicate, andCompute Information. Science, 332 (6025), 60-65. martinhilbert.net/worldinfocapacity.html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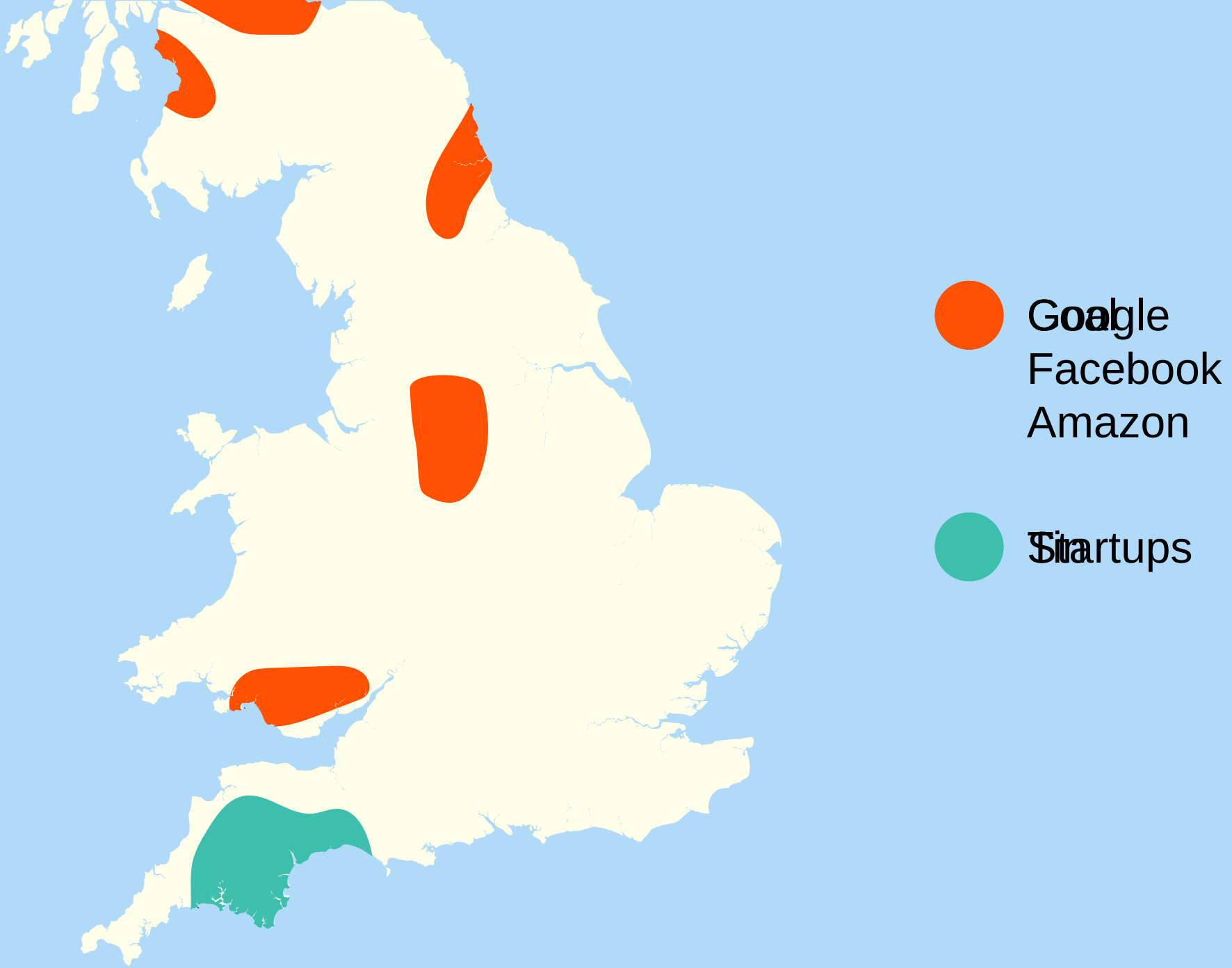
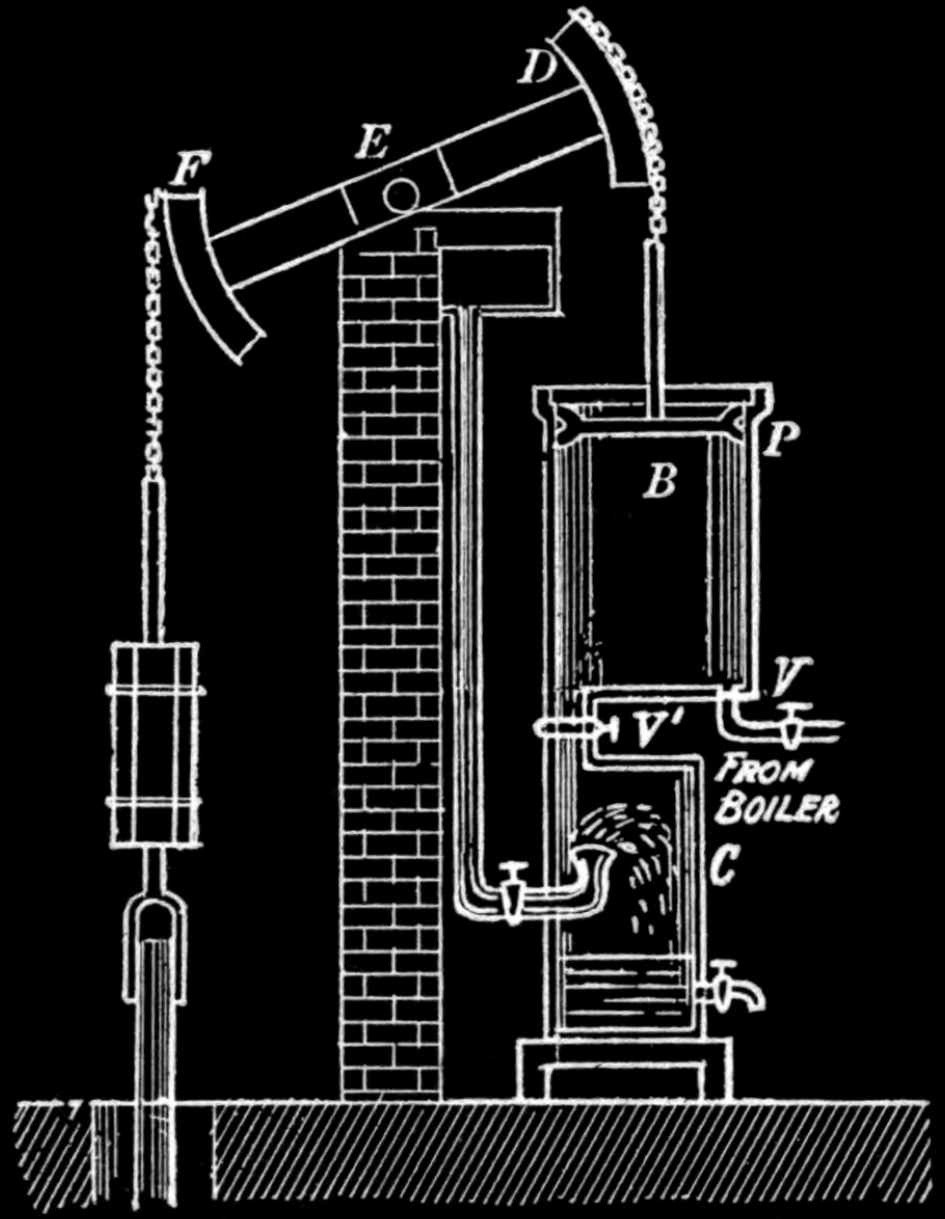

Google
Facebook
Amazon
Startups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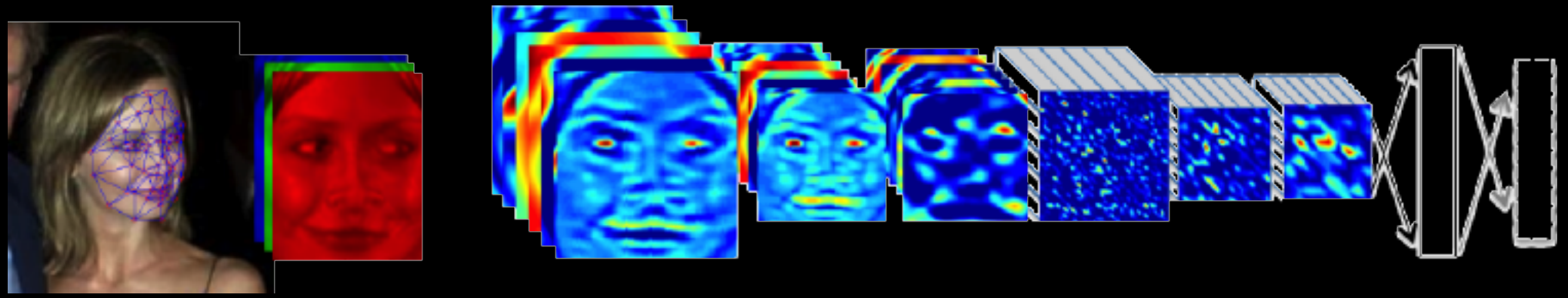
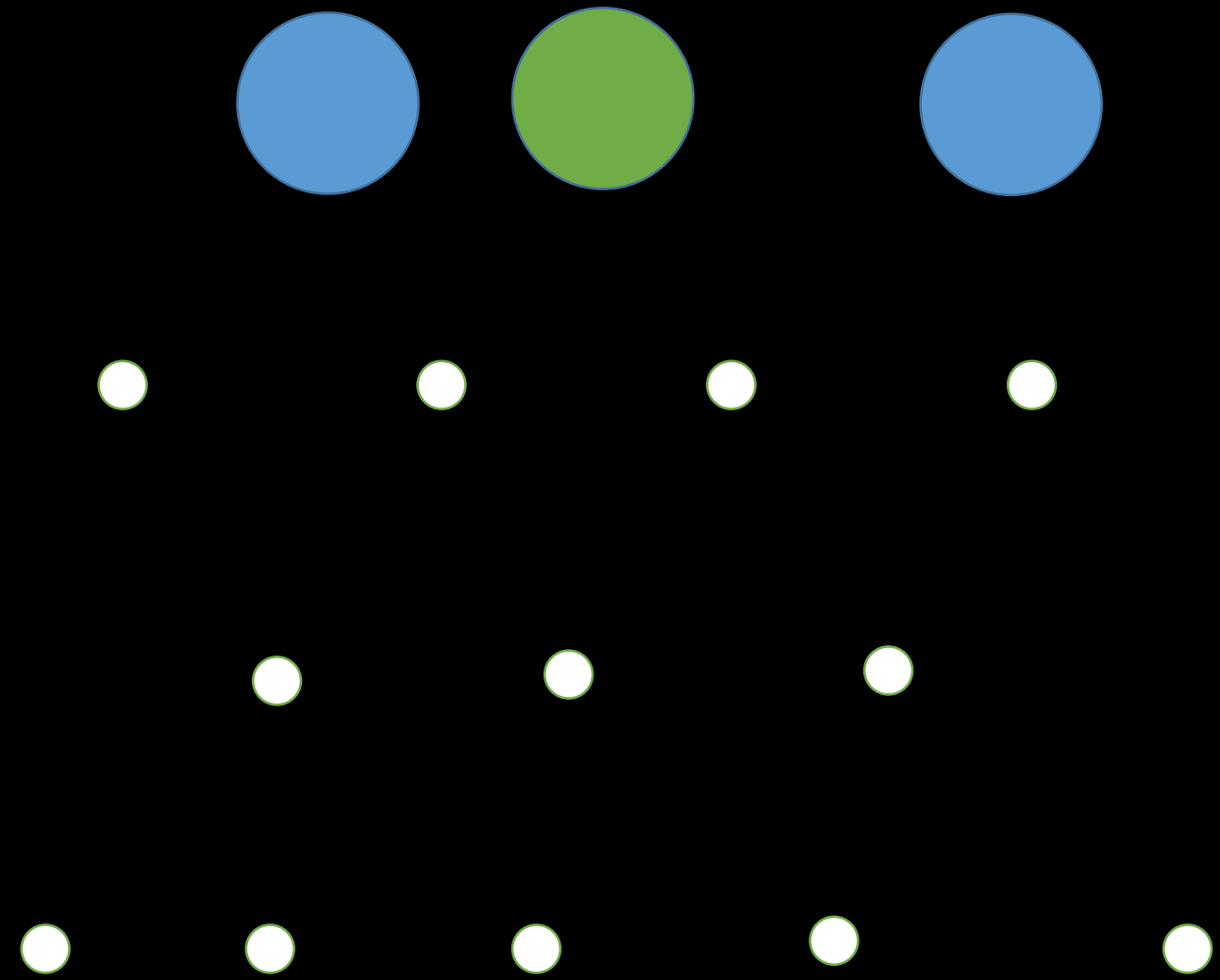
Outline of the DeepFace architecture. A front-end of a single convolution-pooling-convolution filtering on the rectified input, followed by three locally-connected layers and two fully-connected layers. Color illustrates feature maps produced at each layer. The net includes more than 120 million parameters, where more than 95% come from the local and fully connected layers.

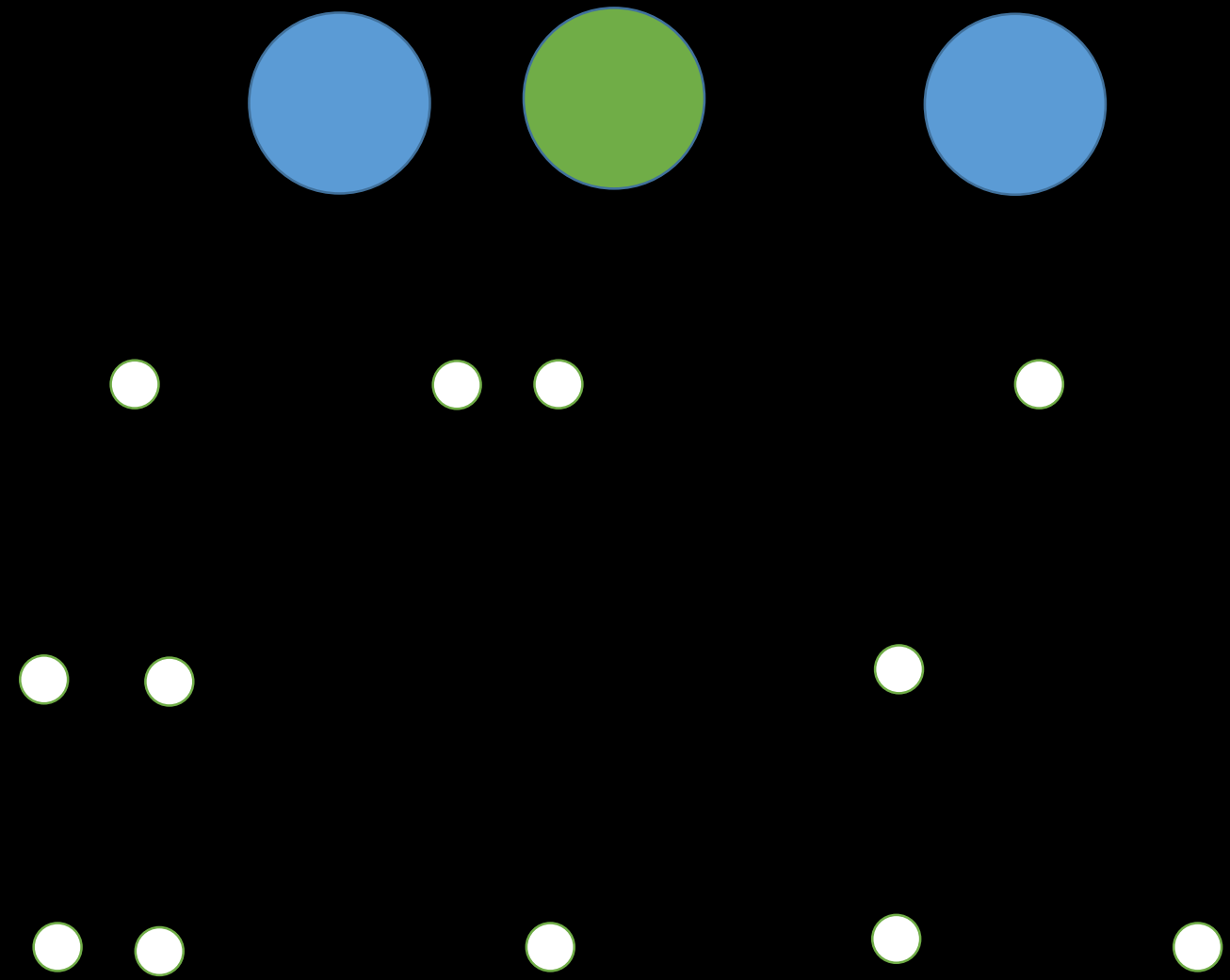


Source: DeepFace



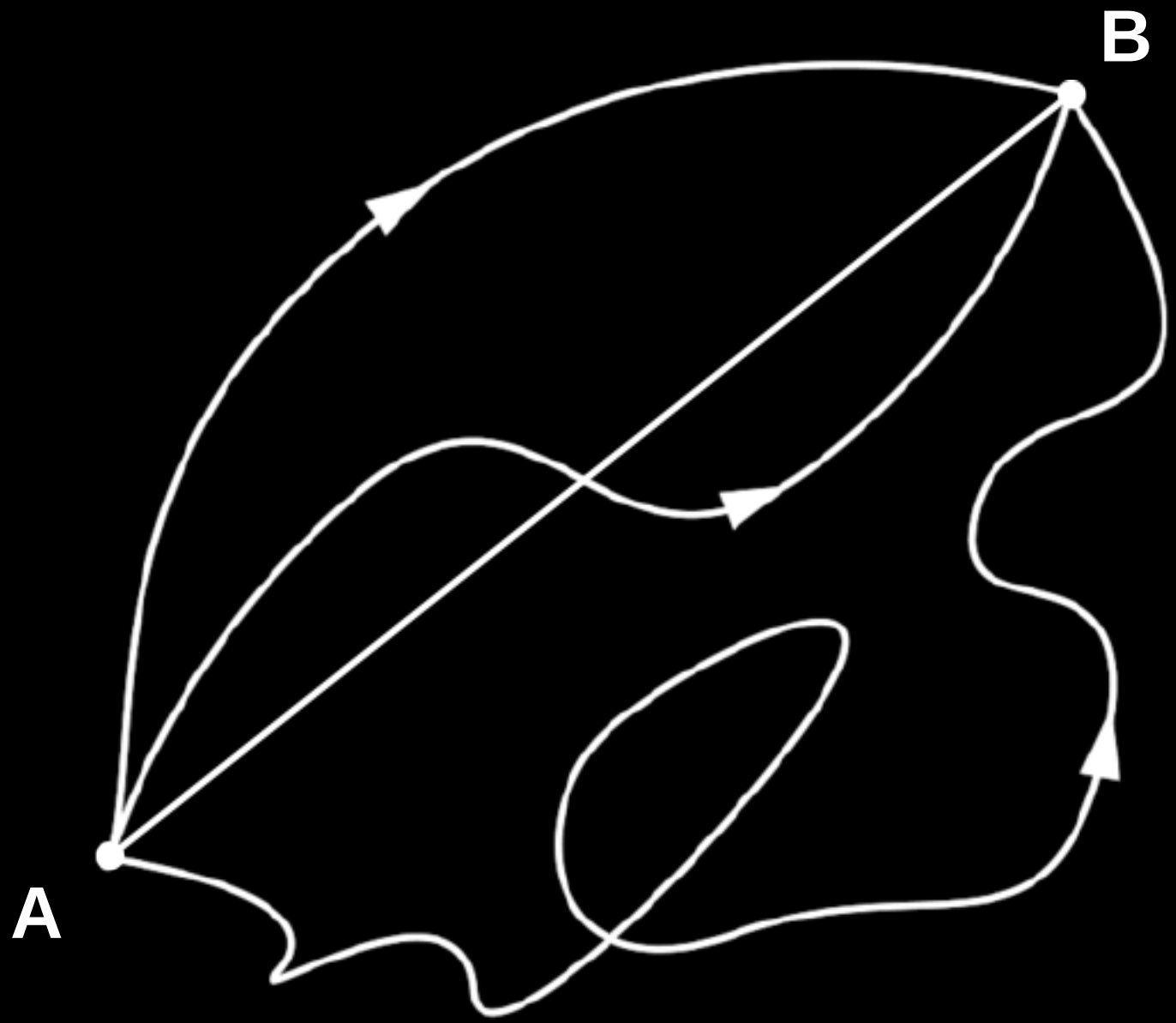
Yes

No



Yes

No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The Bandwagon

CLAUDE E. SHANNON

INFORMATION theory has, in the last few years, become something of a scientific bandwagon. Starting as a technical tool for the communication engineer, it has received an extraordinary amount of publicity in the popular as well as the scientific press. In part, this has been due to connections with such fashionable fields as computing machines, cybernetics, and automation; and in part, to the novelty of its subject matter. As a consequence, it has perhaps been ballooned to an importance beyond its actual accomplishments. Our fellow scientists in many different fields, attracted by the fanfare and by the new avenues opened to scientific analysis, are using these ideas in their own problems. Applications are being made to biology, psychology, linguistics, fundamental physics, economics, the theory of organization, and many others. In short, information theory is currently partaking of a somewhat heady draught of general popularity.

Although this wave of popularity is certainly pleasant and exciting for those of us working in the field, it carries at the same time an element of danger. While we feel that information theory is indeed a valuable tool in providing fundamental insights into the nature of communication problems and will

subject are aimed in a very specific direction, a direction that is not necessarily relevant to such fields as psychology, economics, and other social sciences. Indeed, the hard core of information theory is, essentially, a branch of mathematics, a strictly deductive system. A thorough understanding of the mathematical foundation and its communication application is surely a prerequisite to other applications. I personally believe that many of the concepts of information theory will prove useful in these other fields—and, indeed, some results are already quite promising—but the establishing of such applications is not a trivial matter of translating words to a new domain, but rather the slow tedious process of hypothesis and experimental verification. If, for example, the human being acts in some situations like an ideal decoder, this is an experimental and not a mathematical fact, and as such must be tested under a wide variety of experimental situations.

Secondly, we must keep our own house in first class order. The subject of information theory has certainly been sold, if not oversold. We should now turn our attention to the business of research and development at the highest scientific plane we can main-

~10 gigaflops

10

~1 gigabit per second

~1000 teraflops?

10^{13}

~100 bits per second?

Thank you

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