Weekly Report（12/09/16）

Progress this week:

1) **Read the paper.**

Combining Sketch and Tone for Pencil Drawing Production.

This is an interesting paper, from the visual effect. Because the love of painting, I tried to reproduce its function. Combining with the sketch and tones of the image information, we want to make the final results more like sketches of pencil drawings. The sketch information of the pencil drawing relies on convolution operations in eight directions. The tones information of the pencil drawing is based on the adjustment of high light, soft light and dark light in order to obtain a good effect, in practical experience.

Generative model selection using a scalable and size-independent complex network classifier.

Due to the previous search for the wrong keywords, result in error direction of the problem. However, due to the appearance of this paper timely, to a certain extent, correcting the errors before. In this paper, we discuss the classifiers of seven kinds of complex networks, using the combination of local variables and global variables, together with the method of machine learning, to discuss the generation of classifiers.

The biggest flaw is that there is no ability to solve the actual network, or that there is no good description of where the difference between the network.

Plan next week:

1) Review the code of the paper, then
2) Prepare the final exam.

This week's results:

An example diagram of *Combining Sketch and Tone for Pencil Drawing Production*:

(a) input image (b) line drawing with strokes (c) tonal texture (d) output

Introduction to new complex networks:

Kronecker Graphs Model (KG). This model generates realistic synthetic networks by applying a matrix operation (the kronecker product) on a small initiator matrix. This model is mathematically tractable and supports many network features, such as small path lengths, heavy tail degree distribution, heavy tails for eigenvalues and eigenvectors, and densification and shrinking diameters over time.

The kronecker product: If A is an $m \times n$ matrix and B is a $p \times q$ matrix, then the Kronecker product $A \otimes B$ is the $mp \times nq$ block matrix:

$$\mathbf{A} \otimes \mathbf{B} = \begin{bmatrix} a_{11}\mathbf{B} & \cdots & a_{1n}\mathbf{B} \\ \vdots & \ddots & \vdots \\ a_{m1}\mathbf{B} & \cdots & a_{mn}\mathbf{B} \end{bmatrix}$$

more explicitly:

$$\mathbf{A} \otimes \mathbf{B} = \begin{bmatrix}
a_{11}b_{11} & a_{11}b_{12} & \cdots & a_{11}b_{1q} & \cdots & \cdots & a_{1n}b_{11} & a_{1n}b_{12} & \cdots & a_{1n}b_{1q} \\
a_{11}b_{21} & a_{11}b_{22} & \cdots & a_{11}b_{2q} & \cdots & \cdots & a_{1n}b_{21} & a_{1n}b_{22} & \cdots & a_{1n}b_{2q} \\
\vdots & \vdots & \ddots & \vdots & & & \vdots & \vdots & \ddots & \vdots \\
a_{11}b_{p1} & a_{11}b_{p2} & \cdots & a_{11}b_{pq} & \cdots & \cdots & a_{1n}b_{p1} & a_{1n}b_{p2} & \cdots & a_{1n}b_{pq} \\
\vdots & \vdots & & \vdots & \ddots & & \vdots & \vdots & & \vdots \\
\vdots & \vdots & & \vdots & & \ddots & \vdots & \vdots & & \vdots \\
a_{m1}b_{11} & a_{m1}b_{12} & \cdots & a_{m1}b_{1q} & \cdots & \cdots & a_{mn}b_{11} & a_{mn}b_{12} & \cdots & a_{mn}b_{1q} \\
a_{m1}b_{21} & a_{m1}b_{22} & \cdots & a_{m1}b_{2q} & \cdots & \cdots & a_{mn}b_{21} & a_{mn}b_{22} & \cdots & a_{mn}b_{2q} \\
\vdots & \vdots & \ddots & \vdots & & & \vdots & \vdots & \ddots & \vdots \\
a_{m1}b_{p1} & a_{m1}b_{p2} & \cdots & a_{m1}b_{pq} & \cdots & \cdots & a_{mn}b_{p1} & a_{mn}b_{p2} & \cdots & a_{mn}b_{pq}
\end{bmatrix}$$

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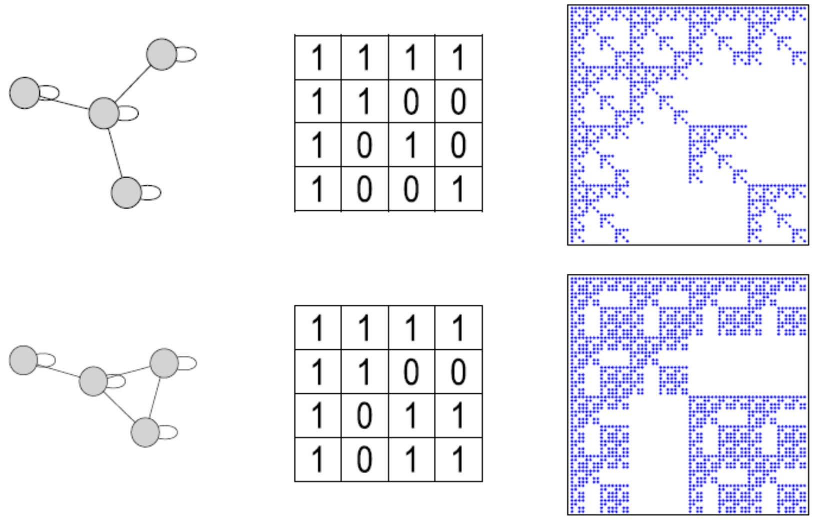
More compactly, we have $(A \otimes B)_{p(r-1)+v,q(s-1)+w} = a_{rs}b_{vw}$

If A and B represent linear transformations $V1 \to W1$ and $V2 \to W2$, respectively, then $A \otimes B$ represents the tensor product of the two maps, $V1 \otimes V2 \to W1 \otimes W2$.

Example:

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \otimes \begin{bmatrix} 0 & 5 \\ 6 & 7 \end{bmatrix} = \begin{bmatrix} 1 \cdot 0 & 1 \cdot 5 & 2 \cdot 0 & 2 \cdot 5 \\ 1 \cdot 6 & 1 \cdot 7 & 2 \cdot 6 & 2 \cdot 7 \\ 3 \cdot 0 & 3 \cdot 5 & 4 \cdot 0 & 4 \cdot 5 \\ 3 \cdot 6 & 3 \cdot 7 & 4 \cdot 6 & 4 \cdot 7 \end{bmatrix} = \begin{bmatrix} 0 & 5 & 0 & 10 \\ 6 & 7 & 12 & 14 \\ 0 & 15 & 0 & 20 \\ 18 & 21 & 24 & 28 \end{bmatrix}.$$



Initiator K_1 K_1 adjacency matrix K_3 adjacency matrix

Forest Fire Model (FF) In this model, edges are added in a process similar to a fire-spreading process. This model is inspired by Copying model (CM) and Community Guided Attachment but supports the shrinking diameter.

Random Typing Generator Model (RTG). RTG uses a process of "random typing" for generating node identifiers. This model mimics real world graphs and conforms to eleven important patterns (such as power law degree distribution, densification power law, and small and shrinking diameter) observed in real networks.