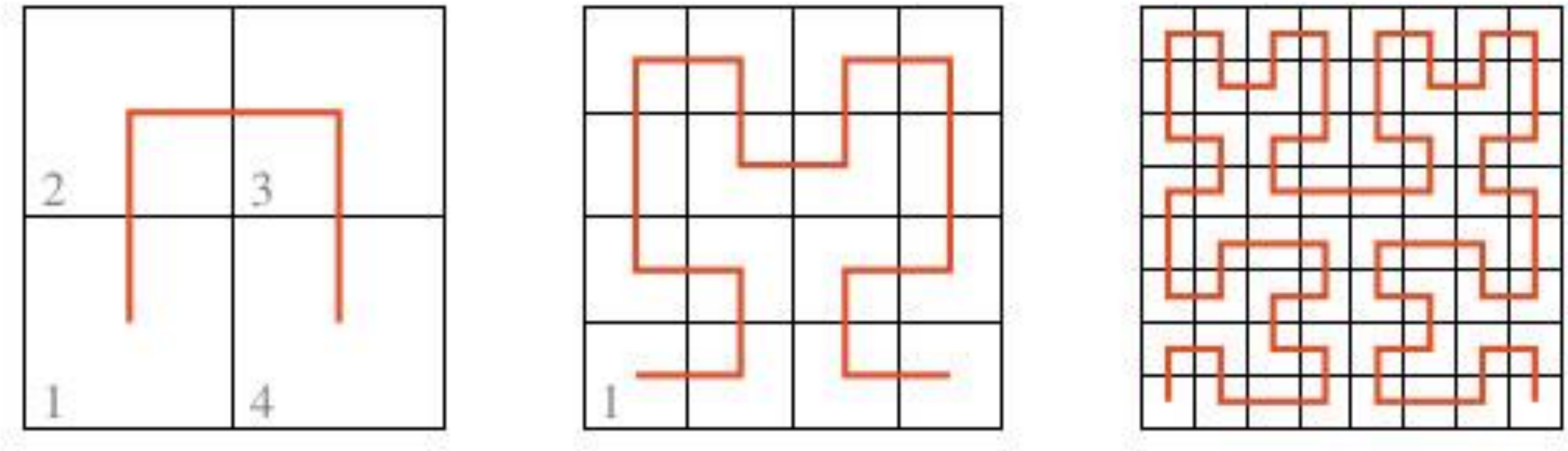
Fraktale

Was ist ein Fraktal?

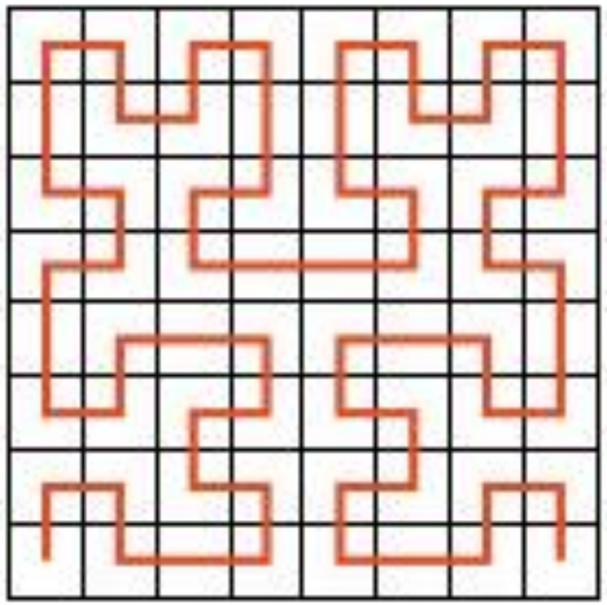
- Wiederholdende Stukturen
- Einfache Regeln
- Unendliche Detailtreue

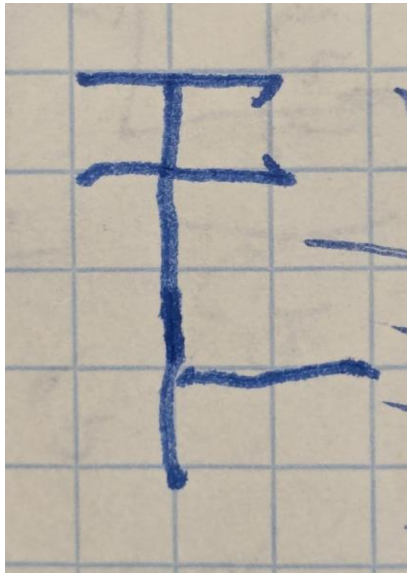
Unser Ziel ist es, daraus resultierend ein Kompressionsverfahren zu entwickeln, das aus jedem Bild jedes andere machen kann

Wie kann ich Fraktale beschreiben?

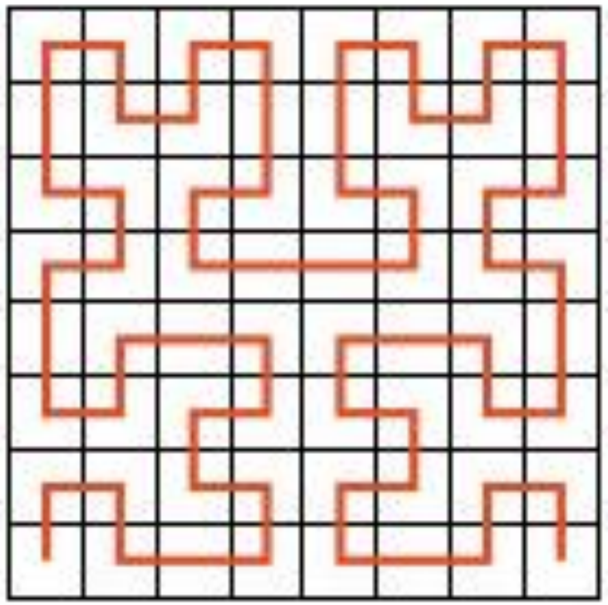


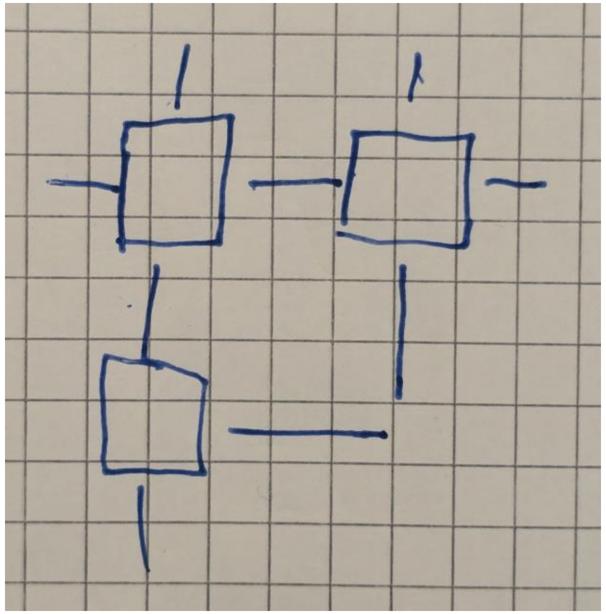
Wie kann ich Fraktale beschreiben?



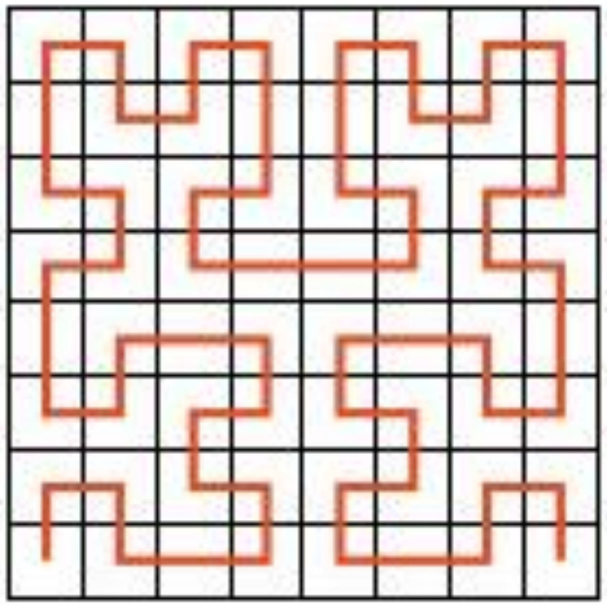


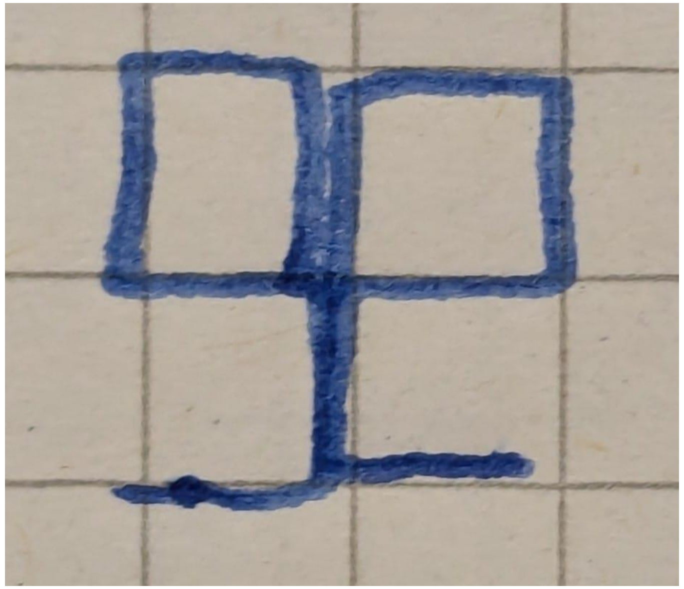
Wie kann ich Fraktale beschreiben?



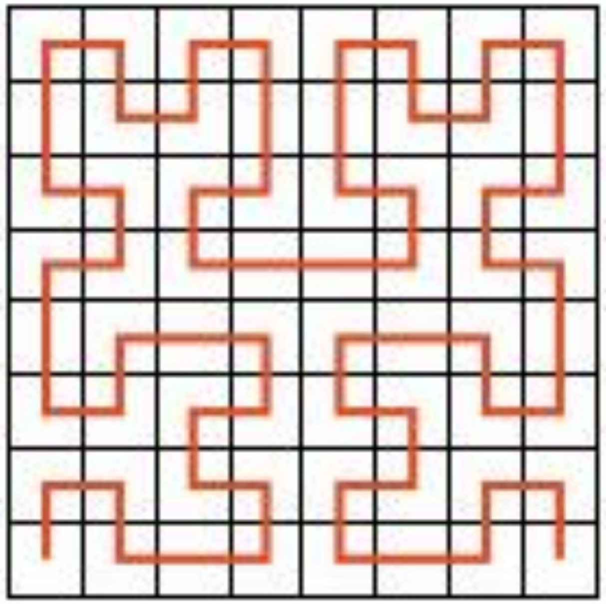


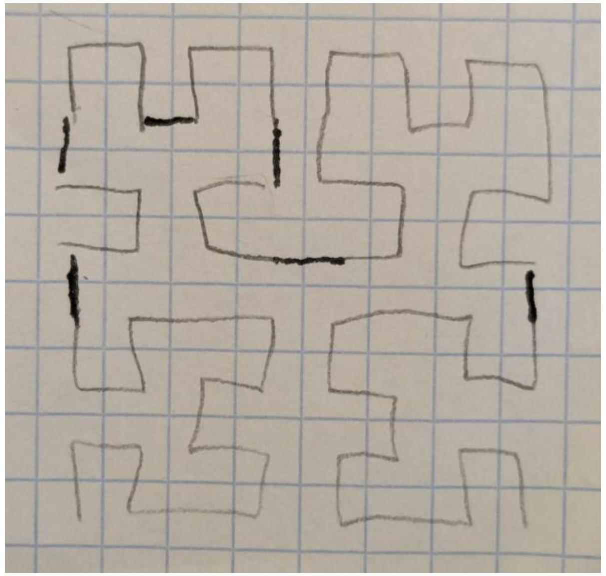
Wie kann ich Fraktale beschreiben?





Wie kann ich Fraktale beschreiben?





Was ist ein IFS?

- IFS → Iteratives Funktionen System
- JEDES Fraktal hat IFS
- n. Iteration im IFS → n. Ordnung des Fraktals

Funktionen des IFS

IFS besteht aus Transformationen wie…

- Verschiebung
- Skalierung
- Drehung
- Spiegelung

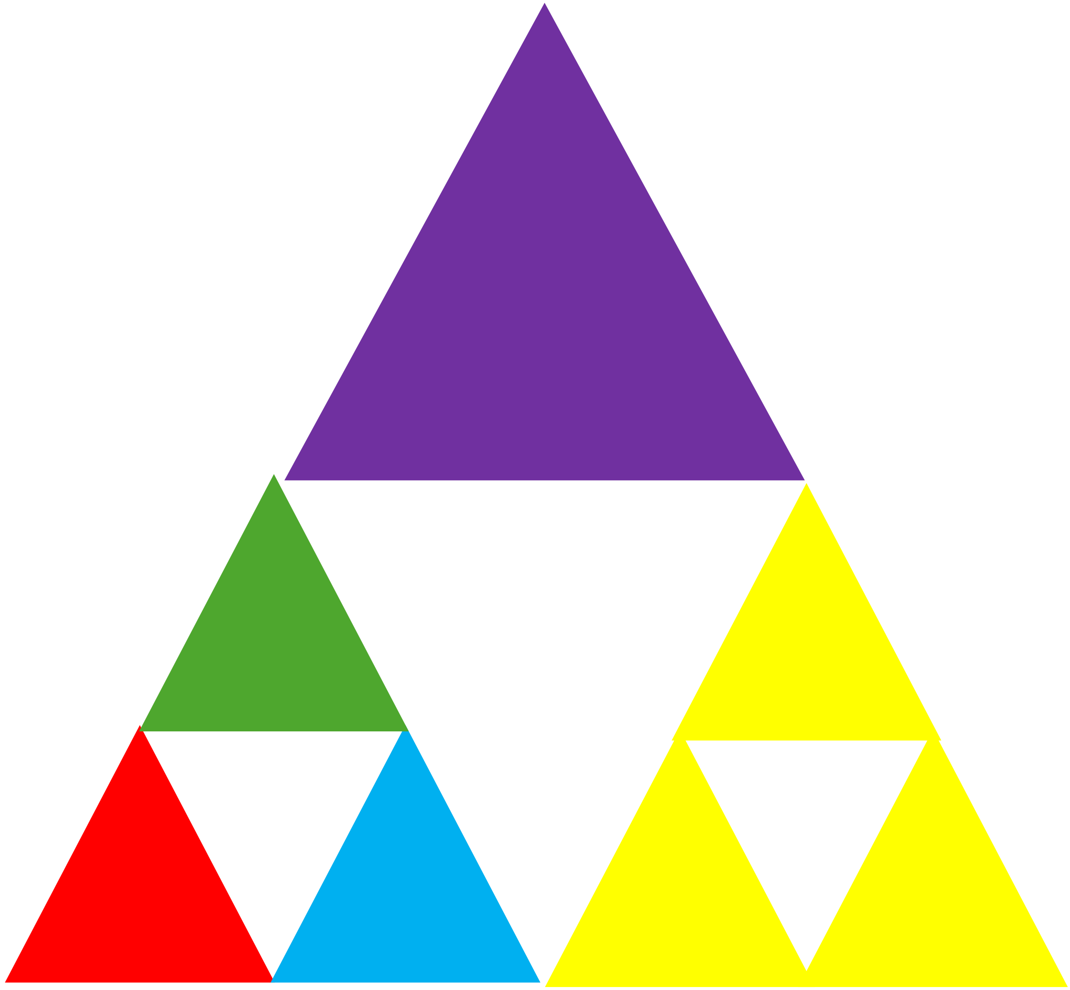
Sierpinski - Dreieck

Sierpinski - Dreieck

Sierpinski - Dreieck

Sierpinski - Dreieck

Sierpinski - Dreieck



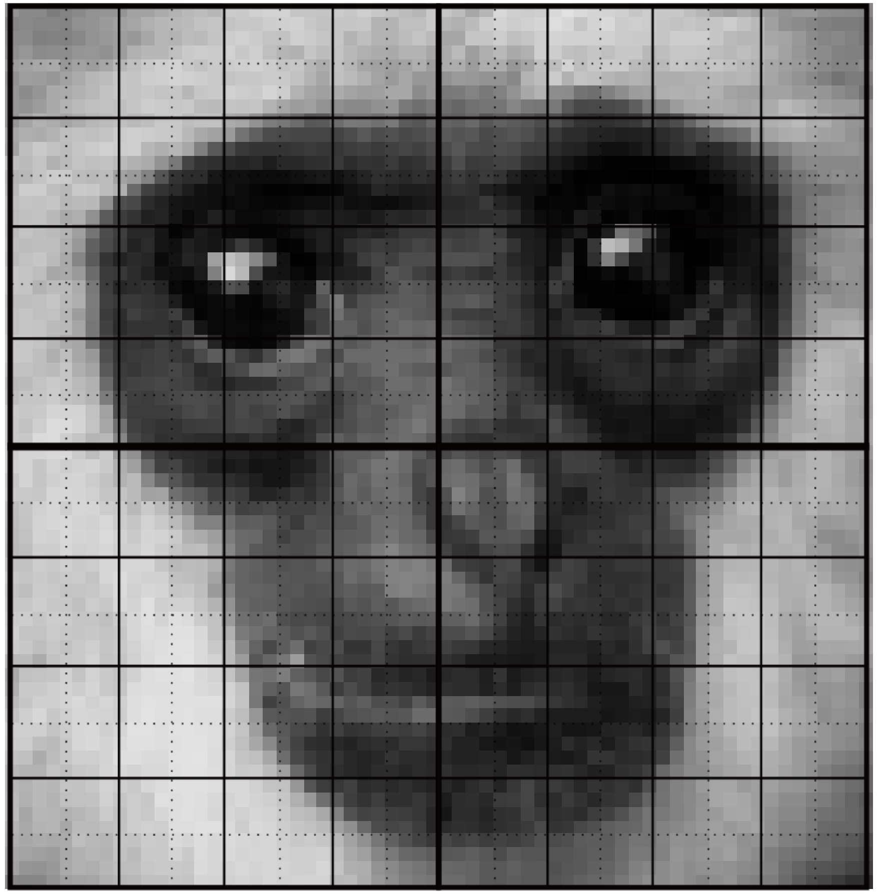
$$w_1(x,y) = \begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix} * \begin{pmatrix} x \\ y \end{pmatrix}$$

$$w_2(x,y) = \begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix} * \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} \frac{1}{2} \\ 0 \end{pmatrix}$$

$$w_2(x,y) = \begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix} * \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} \frac{1}{4} \\ \frac{\sqrt{3}}{2} \end{pmatrix}$$

Drachenkurve

0



Fixpunkte & Collage-Theorem

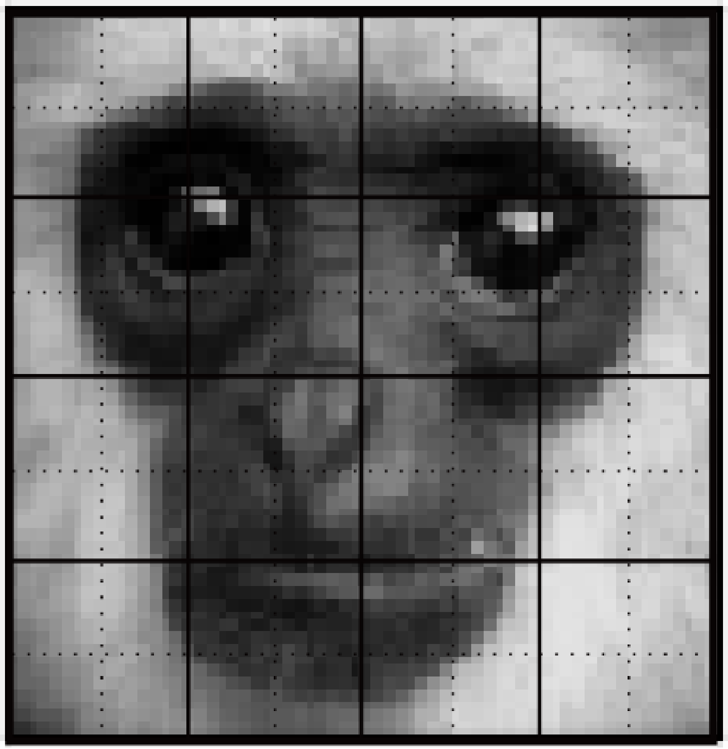
S	Grundmenge
F(S)	Alle Funktionen des IFS
F(F(F....(S)))	Fraktal
F(A) = A	Fixpunkt

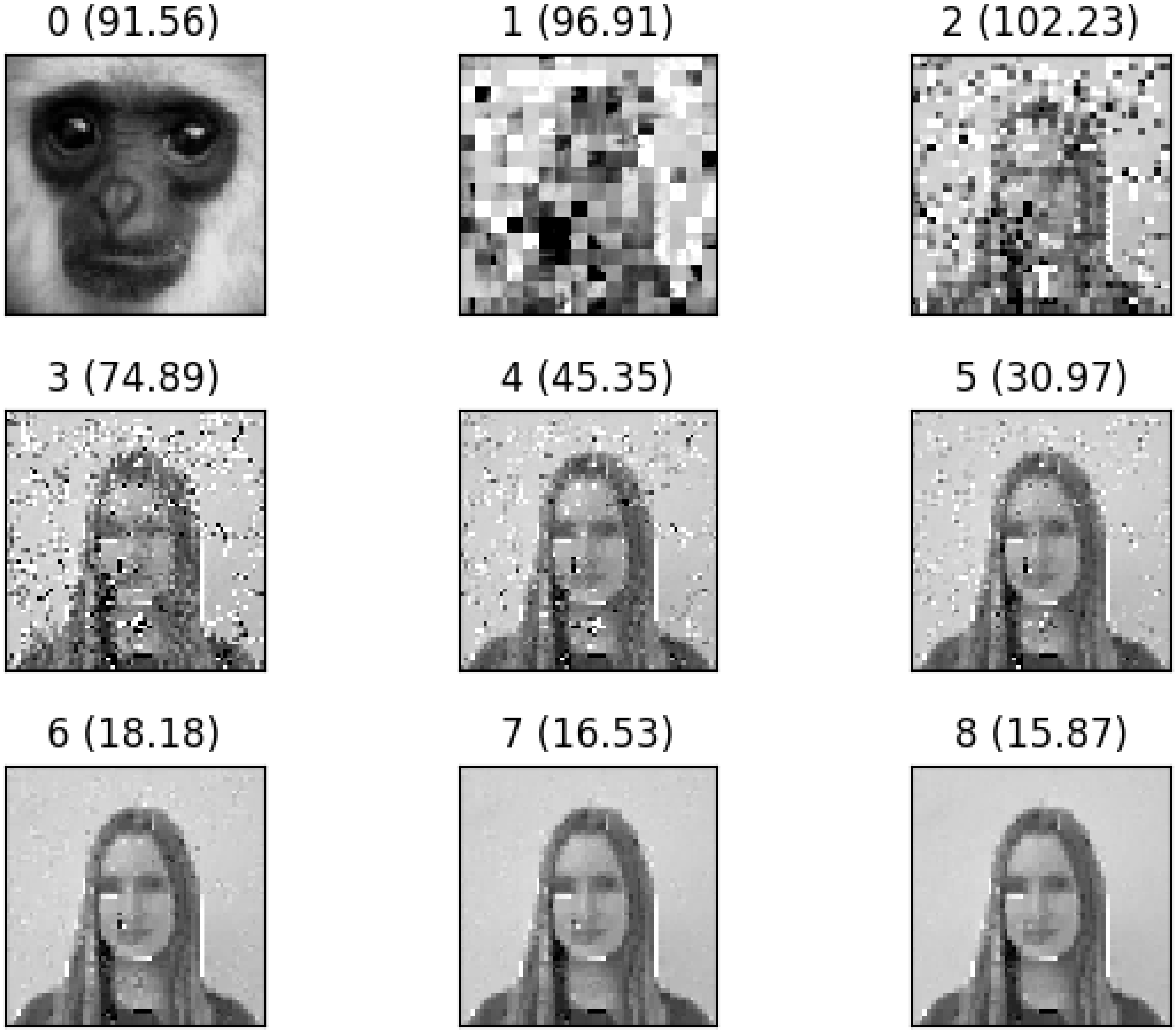
Erkenntnis:

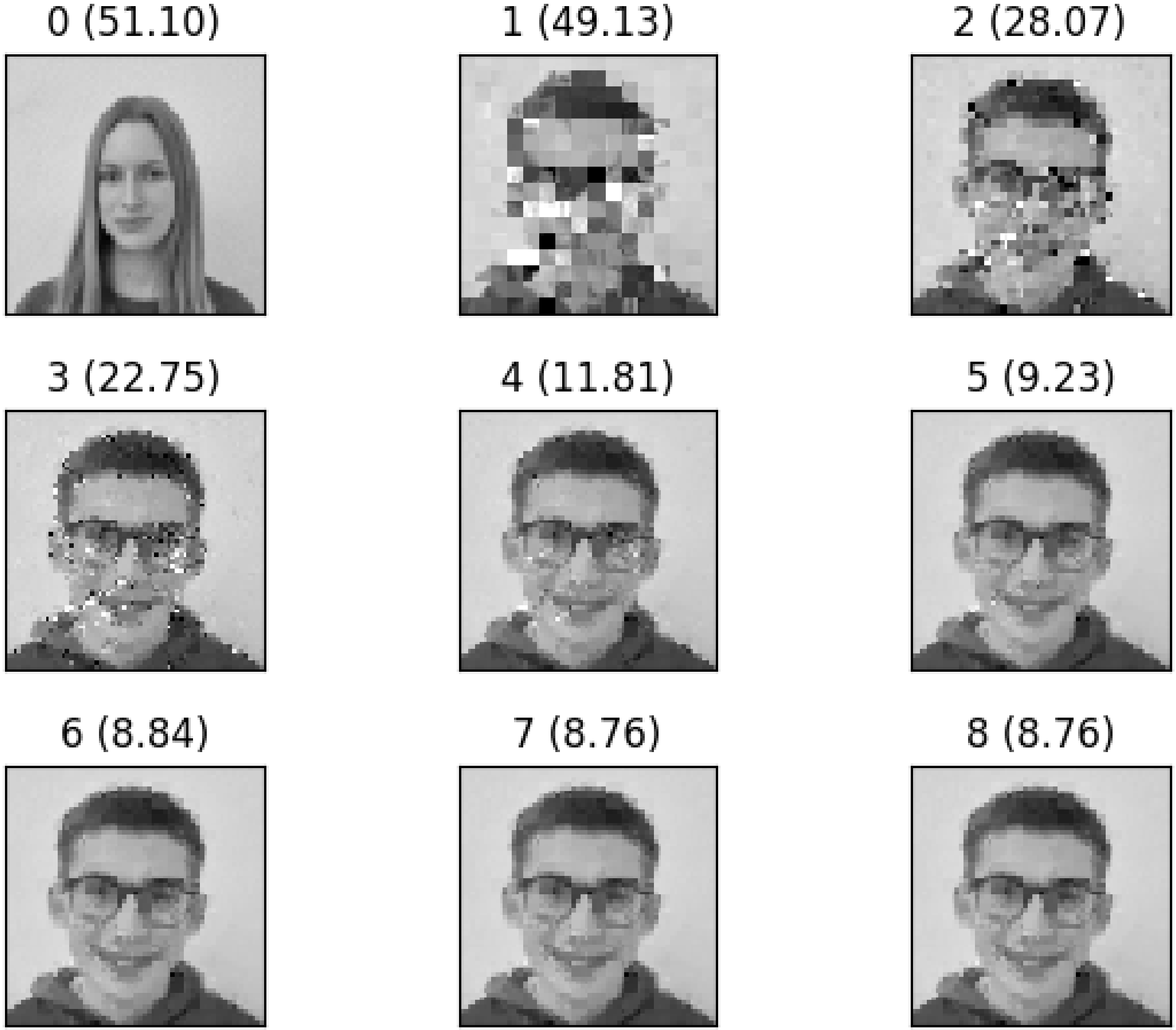
Für eine gegebene Menge (Foto) kann immer ein IFS gefunden werden, dessen Fixpunkt genau dieses Foto ist.
Es reicht die Funktion F anstelle des Fotos abzuspeichern.

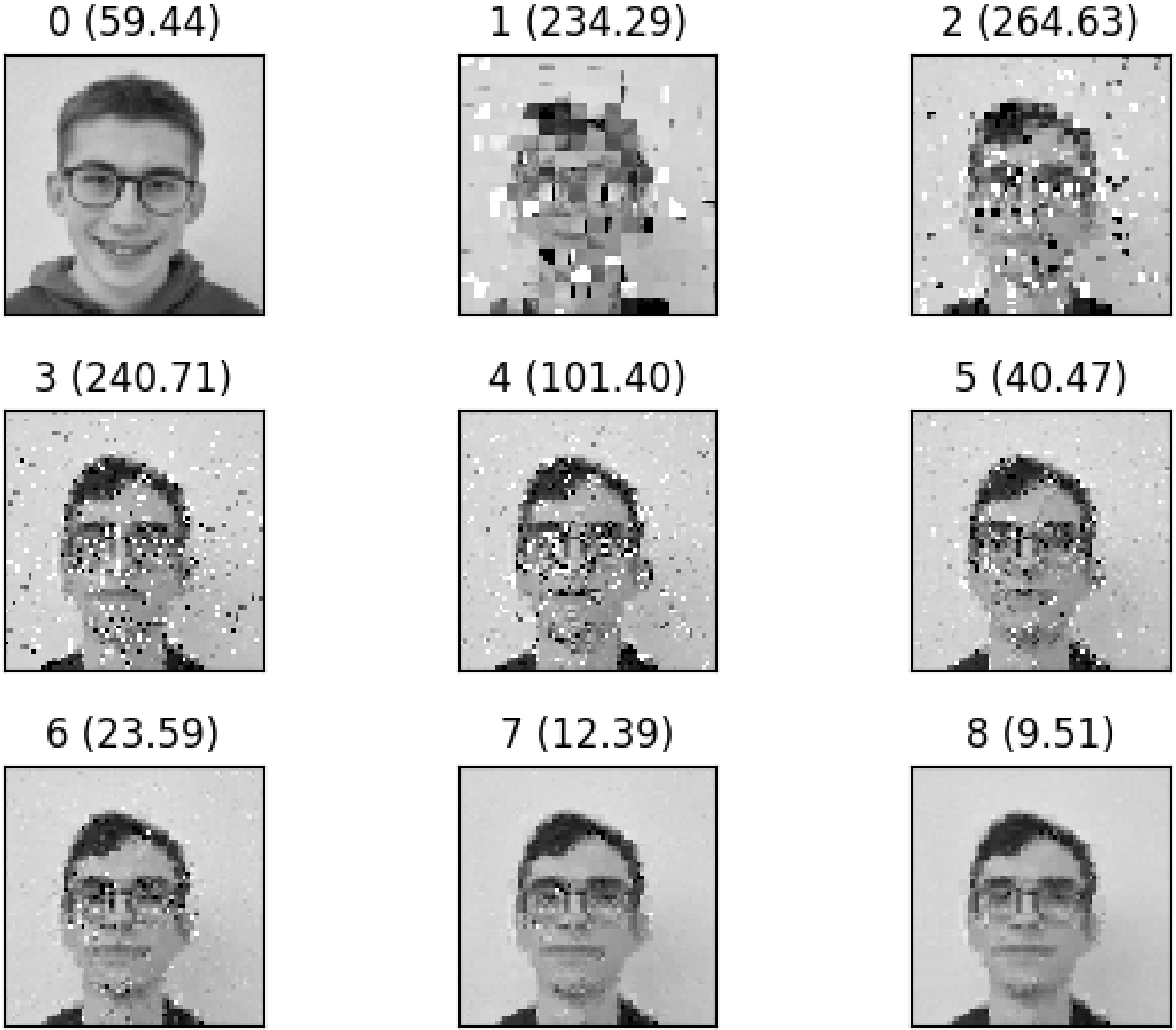
Implementierung

Implementierung

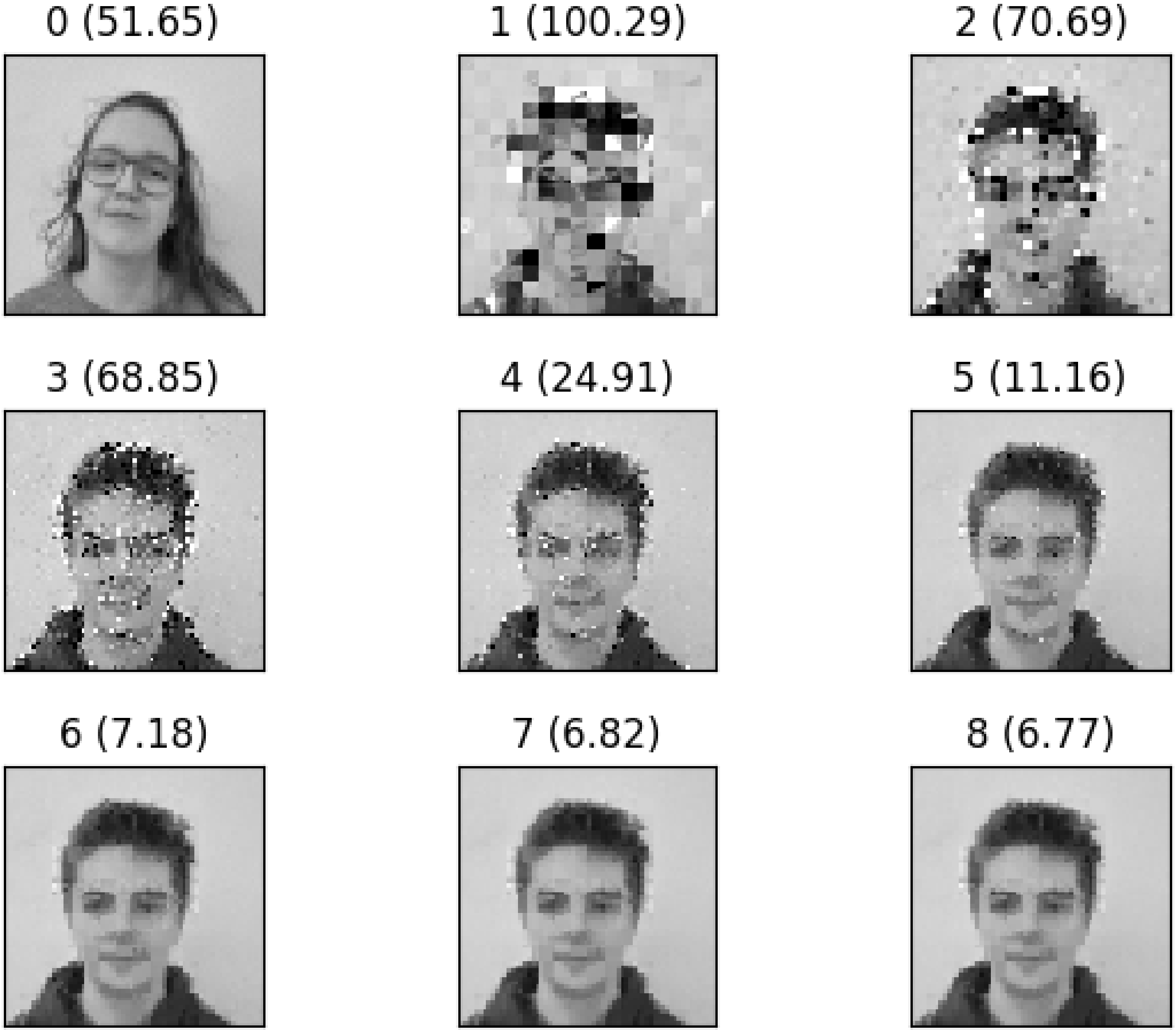


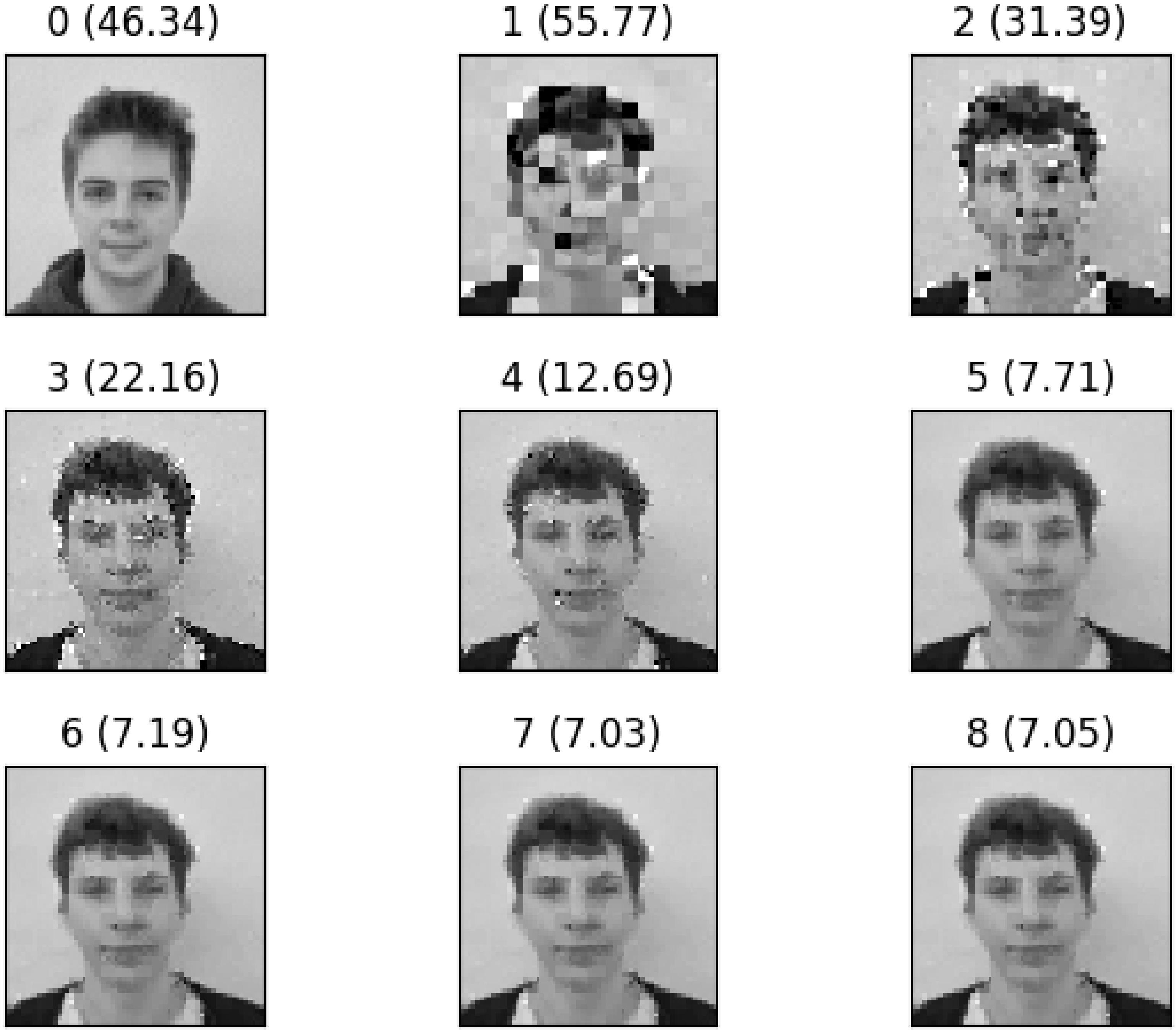

0 (91.56)
1 (96.91)
2 (102.23)
3 (74.89)
4 (45.35)
5 (30.97)
6 (18.18)
7 (16.53)
8 (15.87)


0 (51.10)
1 (49.13)
2 (28.07)
3 (22.75)
4 (11.81)
5 (9.23)
6 (8.84)
7 (8.76)
8 (8.76)

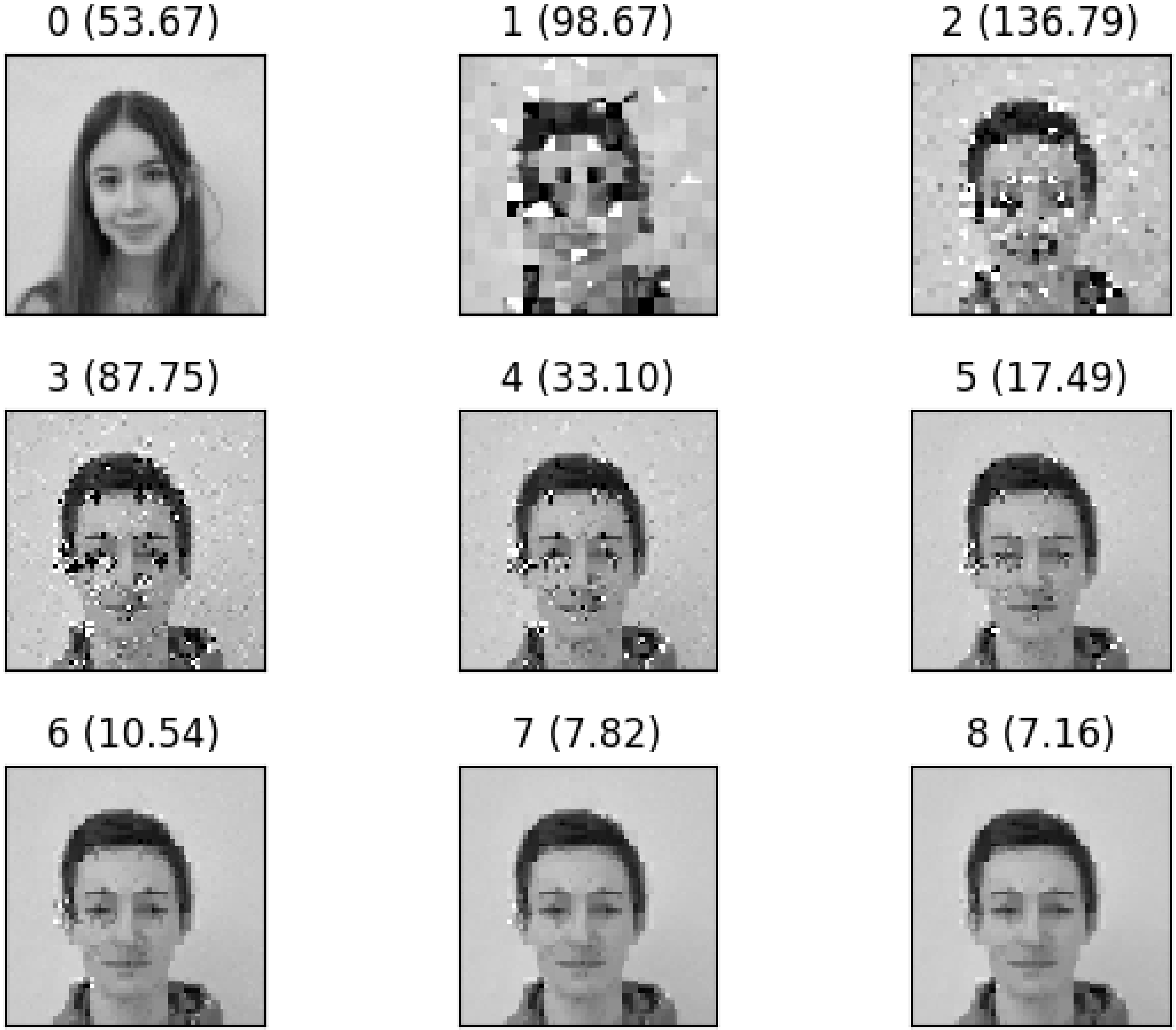

0 (59.44)
1 (234.29)
2 (264.63)
3 (240.71)
4 (101.40)
5 (40.47)
6 (23.59)
7 (12.39)
8 (9.51)


0 (56.09)
1 (70.19)
2 (63.83)
3 (54.92)
4 (20.64)
5 (11.30)
6 (9.15)
7 (8.55)
8 (8.47)


0 (51.65)
1 (100.29)
2 (70.69)
3 (68.85)
4 (24.91)
5 (11.16)
6 (7.18)
7 (6.82)
8 (6.77)


0 (46.34)
1 (55.77)
2 (31.39)
3 (22.16)
4 (12.69)
5 (7.71)
6 (7.19)
7 (7.03)
8 (7.05)


0 (58.14)
1 (64.18)
2 (144.27)
3 (45.55)
4 (29.27)
5 (14.18)
6 (10.28)
7 (7.70)
8 (7.51)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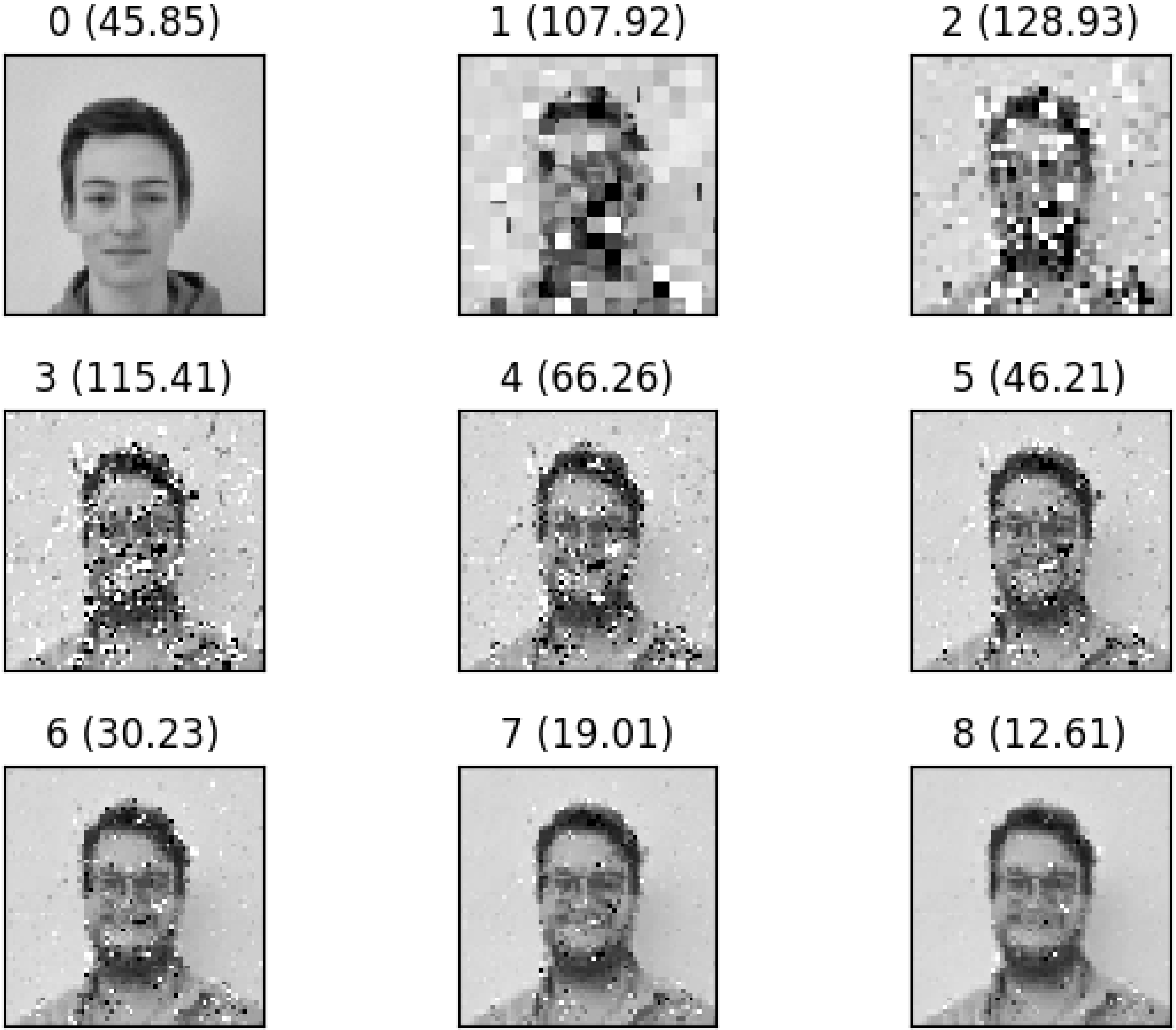
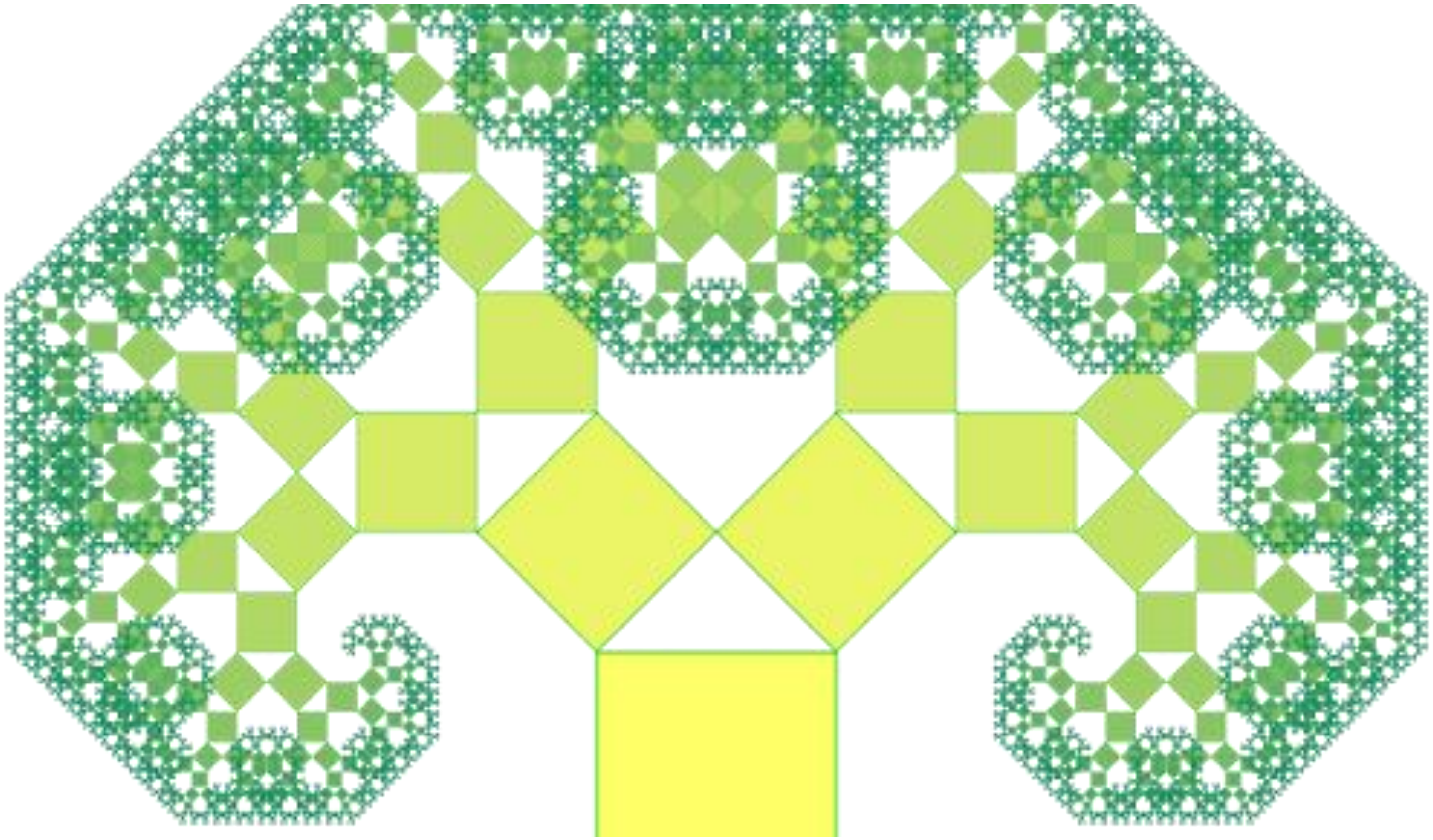
3 (87.75)
4 (33.10)
5 (17.49)
6 (10.54)
7 (7.82)
8 (7.16)


0 (45.85)
1 (107.92)
2 (128.93)
3 (115.41)
4 (66.26)
5 (46.21)
6 (30.23)
7 (19.01)
8 (12.61)


0 (55.71)
1 (59.78)
2 (36.56)
3 (31.71)
4 (15.00)
5 (10.27)
6 (9.83)
7 (9.86)
8 (9.77)



 -Baum