**(Für unseren Fall macht nur MAXpooling Sinn)  
(Die Laufzeiten sind irgendwie random und ergeben wenig Sinn!)**

**Ein Conv./Pooling layer (3x3)(2x2)**  
Ein Bild, das Text, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung

|  |  |
| --- | --- |
| Normal | 98.69% |
| Shifted | 93.69% |
| Rotated | 96.29% |
| Shifted and rotated | 82.26% |
| Time | 6.96 min / 7.87 min |

**Ein Conv./Pooling layer (2x2) (2x2)**  
Ein Bild, das Text, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung

|  |  |
| --- | --- |
| Normal | 98.33% |
| Shifted | 92.71% |
| Rotated | 95.50% |
| Shifted and rotated | 77.28% |

**Ein Conv./Pooling layer (3x3) (3x3)**  
Ein Bild, das Text, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung

|  |  |
| --- | --- |
| Normal | 98.74% |
| Shifted | 94.18% |
| Rotated | 95.81% |
| Shifted and rotated | 81.09% |
| Time | 5.47 min |

**Ein Conv./Pooling layer (4x4) (4x4)**

|  |  |
| --- | --- |
| Normal | 98.77% |
| Shifted | 95.13% |
| Rotated | 96.85% |
| Shifted and rotated | 84.02% |
| Time | 4.96 min |

**Ein Conv./Pooling layer (4x4) (2x2)**

|  |  |
| --- | --- |
| Normal | 98.78% |
| Shifted | 95.05% |
| Rotated | 96.49% |
| Shifted and rotated | 84.00% |
| Time | 7.32 min |

**Ein Conv./Pooling layer (2x2) (4x4)**

|  |  |
| --- | --- |
| Normal | 98.05% |
| Shifted | 91.59% |
| Rotated | 94.74% |
| Shifted and rotated | 75.10% |

**Fazit:**Das erhöhen der Filtergrößen bringt eine Verbesserung der Genauigkeit des Netzwerkes mit sich. Die Vergrößerung des Konvolution Filters hat dabei einen Größeren Einfluss.  
Der Sprung auf 4x4 bringt vor allem eine Verbesserung der Ergebnisse im Hinblick auf das „Shifted&Rotated“ Dataset mit sich.  
(Ergebnisse variieren von Run to Run!!!)  
(Die Testzeiten sind sehr Radom, daher eignen sie sich nicht zu einer guten Evaluation des Netzwerkes -> Nur auf Genauigkeit Fokussieren)

Das (4x4) (4x4) Netzwerk ist am besten

**Eine zweite Pooling/Convolution Schicht direkt hinter der ersten**

**Ein Bild, das Text, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung**Das zweite Layer hat (4x4) Conv. und (2x2) Pooling da 2x(4x4) nicht möglich ist

(So wird es eigentlich immer vorgeschlagen, daher sollte man da vllt noch weiter rumprobieren)

|  |  |
| --- | --- |
| Normal | 98.24% |
| Shifted | 88.00% |
| Rotated | 94.19% |
| Shifted and rotated | 72.99% |
| Time | 5.56 min |

**Test mit (2x2) (2x2)**

|  |  |
| --- | --- |
| Normal | 98.63% |
| Shifted | 90.04% |
| Rotated | 94.97% |
| Shifted and rotated | 71.97% |
| Time | 5.52 min |

**Eine zweite Conv./Pooling Schicht zwischen den Dense-Layern**

**Ein Bild, das Text, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung**

|  |  |
| --- | --- |
| Normal | 98.84% |
| Shifted | 95.57% |
| Rotated | 97.21% |
| Shifted and rotated | 86.68% |
| Time | 7.85 min |

**Test mit 2x(2x2)**

|  |  |
| --- | --- |
| Normal | 98.63% |
| Shifted | 95.87% |
| Rotated | 97.41% |
| Shifted and rotated | 85.57% |
| Time | 8.54 min |

* **Second Conv./Pooling layer increases the performance of the S&R Dataset**

**Sepl altes Netzwerk ausprobieren**

**Test mit 2x(3x3,2x2)**

**Ein Bild, das Text, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung**

|  |  |
| --- | --- |
| Normal | 99.18% |
| Shifted | 96.04% |
| Rotated | 96.90% |
| Shifted and rotated | 86.66% |
| Time | 13.09 min |

* **Significant improvement compared to 4x4**
* **Kein Dropout layer!**

**Mit Dropout layer (0.5)**

**Ein Bild, das Text, Screenshot, Schrift, Software enthält.

Automatisch generierte Beschreibung**

|  |  |
| --- | --- |
| Normal | 99.10% |
| Shifted | 96.45% |
| Rotated | 97.10% |
| Shifted and rotated | 86.28% |
| Time | 11.44 min |

* **Sepl does not have 2. Dense layer**

**Without 2. Dense layer**

|  |  |
| --- | --- |
| Normal | 99.22% |
| Shifted | 96.01% |
| Rotated | 97.41% |
| Shifted and rotated | 86.37% |
| Time | 11.14 min |

* **Dense layer was not the difference!!!**

**2 Dropout layers with 0.2 + 3 Filter layers**

**Ein Bild, das Text, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung**

|  |  |
| --- | --- |
| Normal | 99.13% |
| Shifted | 96.33% |
| Rotated | 97.03% |
| Shifted and rotated | 88.57% |
| Time | 14.17 min |

* **Best results for S&R so far! (But long computation time)**

**Eine dritte Pooling/Convolution Schicht mit extra Dense-Layer**

**Ein Bild, das Text, Screenshot enthält.

Automatisch generierte Beschreibung**

|  |  |
| --- | --- |
| Normal | 98.88% |
| Shifted | 95.05% |
| Rotated | 96.97 |
| Shifted and rotated | 85.42% |
| Time | 11.81 min |

* **Not much improvements in the results**

**For Fun:**

**1x(5x5)**

|  |  |
| --- | --- |
| Normal | 98.75% |
| Shifted | 92.56% |
| Rotated | 96.29% |
| Shifted and rotated | 79.77% |
| Time | 4.32 min |

* **2 Filter-layers a needed for good performance of S&R**

**All 2x(2x2)**

|  |  |
| --- | --- |
| Normal | 98.48% |
| Shifted | 94.15% |
| Rotated | 95.96% |
| Shifted and rotated | 82.03% |
| Time | 10.06 min |

* **No significant improvement**

**Convolutions layers now use ‘elu’ as an activation function (using best model from before)**

|  |  |
| --- | --- |
| Normal | 98.86% |
| Shifted | 95.31% |
| Rotated | 96.50% |
| Shifted and rotated | 86.60% |
| Time | 7.69 min |

* **No significant improvement**

**Convolutions layers now use ‘leaky\_relu’ as an activation function (using best model from before)**

|  |  |
| --- | --- |
| Normal | 98.62% |
| Shifted | 95.63% |
| Rotated | 96.74% |
| Shifted and rotated | 86.32% |
| Time | 8.54 min |

* **No significant improvement**

**2x(4x4),(4x4)(2x2), dense, (4x4)(2x2), dense**

|  |  |
| --- | --- |
| Normal | 98.32% |
| Shifted | 90.77% |
| Rotated | 95.84% |
| Shifted and rotated | 78.35% |
| Time | 9.47 min |

* **No significant improvement**