# RECORD

## Baseline

实现了一个简单的卷积神经网络。

Train loss可以接近为0，Train f2-score可用达到99.5%

用于验证算法的正确性（loss函数、代码框架等）

## ResNet50

### Model-1~6

分阶段迁移学习：一开始只训练最后两层，然后逐步打开预训练层的权重

阈值搜索：新增了基于BFGS的搜索和Greedy搜索，可以大幅提高准确率，但是不知道阈值的泛化能力如何（参考Kaggle比赛中的两支冠军队伍，均是在Validation集上搜索阈值）

图片随机增强：horizontal flip、random shift、random rotation

结果：最好可达到87.4%（训练12个Epoch达到最优，然后下降）

### Model-7

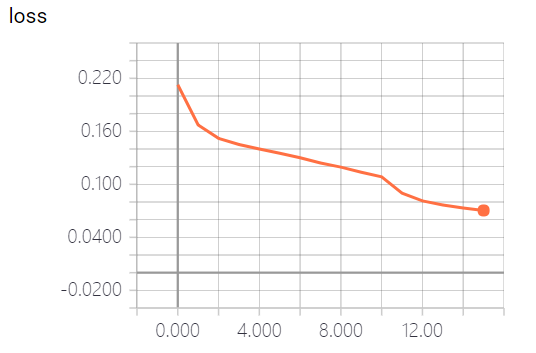
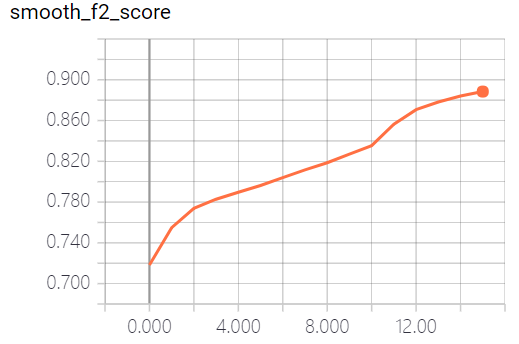
1. 取消了图像的mean、std预处理: 之前使用基于像素的图像mean、std预处理，从生成的图片来看有问题（Keras动态生成图片导出），后面可尝试改为基于通道的均值。
2. 使用include top=False预训练参数

#### Metric

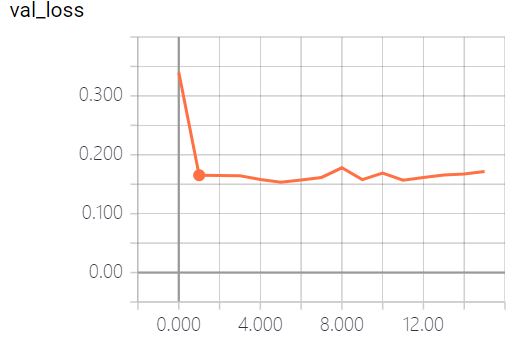
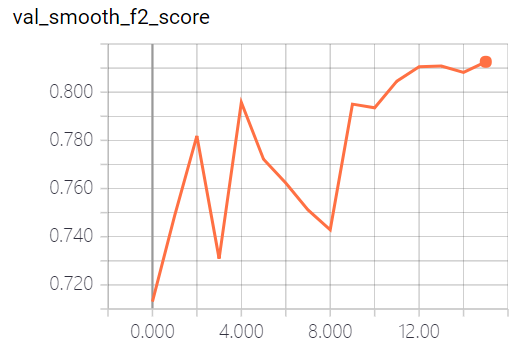
weights.007.hdf5  
####### Smooth F2-Score is 0.752615 #######  
####### F2-Score with threshold 0.2 is 0.861973 #######  
####### F2-Score with threshold 0.1 is 0.860249 #######  
####### Basonhopping F2-Score is 0.872198 #######  
####### Greedy F2-Score is 0.873286 #######  
  
weights.009.hdf5  
####### Smooth F2-Score is 0.741987 #######  
####### F2-Score with threshold 0.2 is 0.848438 #######  
####### F2-Score with threshold 0.1 is 0.850239 #######  
####### Basonhopping F2-Score is 0.872164 #######  
####### Greedy F2-Score is 0.874792 #######  
  
weights.010.hdf5  
####### Smooth F2-Score is 0.794807 #######  
####### F2-Score with threshold 0.2 is 0.869044 #######  
####### F2-Score with threshold 0.1 is 0.872603 #######  
####### Basonhopping F2-Score is 0.876129 #######  
####### Greedy F2-Score is 0.877365 #######  
  
weights.011.hdf5  
####### Smooth F2-Score is 0.789265 #######  
####### F2-Score with threshold 0.2 is 0.860144 #######  
####### F2-Score with threshold 0.1 is 0.862353 #######  
####### Basonhopping F2-Score is 0.870077 #######  
####### Greedy F2-Score is 0.873587 #######  
  
weights.012.hdf5  
####### Smooth F2-Score is 0.800313 #######  
####### F2-Score with threshold 0.2 is 0.869751 #######  
####### F2-Score with threshold 0.1 is 0.874894 #######  
####### Basonhopping F2-Score is 0.878213 #######  
####### Greedy F2-Score is 0.879970 #######  
  
weights.013.hdf5  
####### F2-Score with threshold 0.2 is 0.867209 #######  
####### F2-Score with threshold 0.1 is 0.873079 #######  
####### Basonhopping F2-Score is 0.876897 #######  
####### Greedy F2-Score is 0.878053 #######  
  
weights.014.hdf5  
####### Smooth F2-Score is 0.804727 #######  
####### F2-Score with threshold 0.2 is 0.866394 #######  
####### F2-Score with threshold 0.1 is 0.871515 #######  
####### Basonhopping F2-Score is 0.875239 #######  
####### Greedy F2-Score is 0.876984 #######  
  
weights.015.hdf5  
####### Smooth F2-Score is 0.802782 #######  
####### F2-Score with threshold 0.2 is 0.863338 #######  
####### F2-Score with threshold 0.1 is 0.870111 #######  
####### Basonhopping F2-Score is 0.874347 #######  
####### Greedy F2-Score is 0.876150 #######

较之前模型，最优值提高约0.5%。均值提高约1%

#### Curve

Loss、smooth f2-Score在epoch=10时有一个加速，此时是打开了所有的层的权重进行训练，并降低学习率到0.00001

Train loss最低值为0.07，而Val 最低值为0.15。说明存在泛化问题。而Val smooth f2-score前期的波动性可能是由于只训练最后两层导致的。

Val loss前期降低非常快，然后趋于饱和，在epoch=10左右，开始出现上升倾向，可能是过拟合了。

结合Evaluation的结果，epoch 7~16变化不大，其中12最优，之后逐渐下降基本符合曲线中12之后loss缓慢上升的趋势。

还有一点是，从7~16，smooth f2-score 增加了几个百分点，但是阈值搜索后的f2-score只变化了零点几个百分点。

### Model-8

1. 去掉图像旋转：AlexNet、ResNet、DenseNet等论文中均为做图像旋转
2. 增大Val batch size为512：希望减少Val smooth f2-score的抖动

结果：

1. 取消掉image rotation几乎没有影响
2. Val batch size增大后，Val smooth f2-score曲线的确变得平滑了

#### Metric

weights.011.hdf5

####### Smooth F2-Score is 0.803181 #######

####### F2-Score with threshold 0.2 is 0.863644 #######

####### F2-Score with threshold 0.1 is 0.863083 #######

####### Greedy F2-Score is 0.874964 #######

weights.012.hdf5

####### Smooth F2-Score is 0.802437 #######

####### F2-Score with threshold 0.2 is 0.869768 #######

####### F2-Score with threshold 0.1 is 0.873220 #######

####### Greedy F2-Score is 0.879088 #######

weights.013.hdf5

####### Smooth F2-Score is 0.806060 #######

####### F2-Score with threshold 0.2 is 0.867854 #######

####### F2-Score with threshold 0.1 is 0.871998 #######

####### Greedy F2-Score is 0.877431 #######

weights.014.hdf5

####### Smooth F2-Score is 0.807866 #######

####### F2-Score with threshold 0.2 is 0.865808 #######

####### F2-Score with threshold 0.1 is 0.870474 #######

####### Greedy F2-Score is 0.876441 #######

weights.015.hdf5

####### Smooth F2-Score is 0.808137 #######

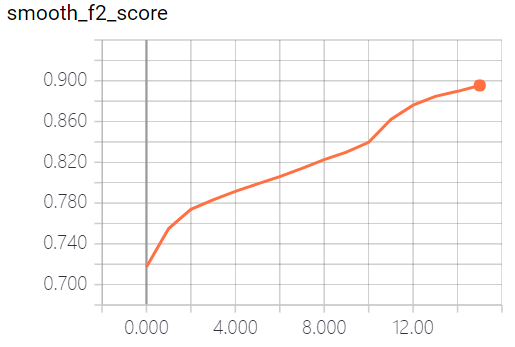
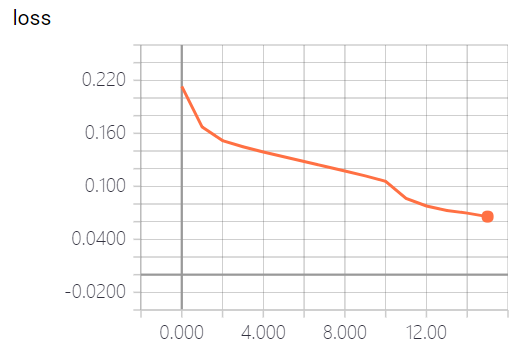
####### F2-Score with threshold 0.2 is 0.864625 #######

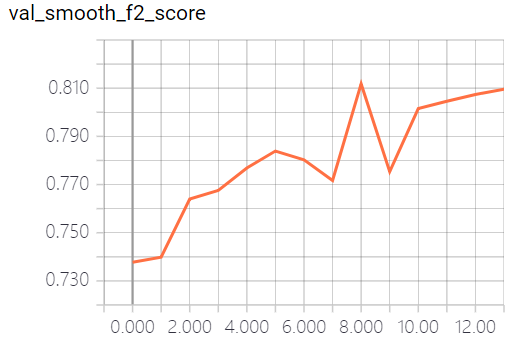
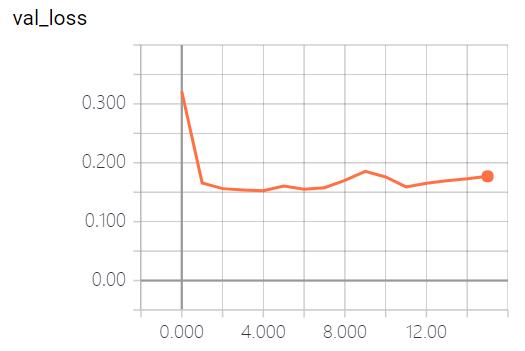
####### F2-Score with threshold 0.1 is 0.869519 #######

####### Greedy F2-Score is 0.876153 #######

与Model 7相比，差异不大

#### Curve





和Model 7差异不大

### Model 9

1. 第一个epoch只训练新增的层，然后直接开放所有参数
2. Epoch 1使用128作为batch size，学习率0.01
3. Epoch 2~10 使用128作为batch size，学习率为0.001（使用256内存申请失败）
4. Epoch 10~20 使用128作为batch size，学习率为0.0001（使用512内存申请失败）
5. 使用SGD，momentum=0.9，decay=0.0005

由于训练的太慢，因此只训练了8个epoch就停止了，准备尝试新的思路

#### Metric

weights.006.hdf5

####### Smooth F2-Score is 0.748128 #######

####### F2-Score with threshold 0.2 is 0.852397 #######

####### F2-Score with threshold 0.1 is 0.848662 #######

####### Greedy F2-Score is 0.858137 #######

weights.007.hdf5

####### Smooth F2-Score is 0.748561 #######

####### F2-Score with threshold 0.2 is 0.856167 #######

####### F2-Score with threshold 0.1 is 0.848487 #######

####### Greedy F2-Score is 0.859564 #######

weights.008.hdf5

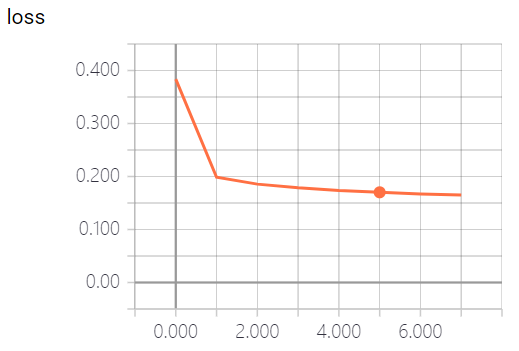
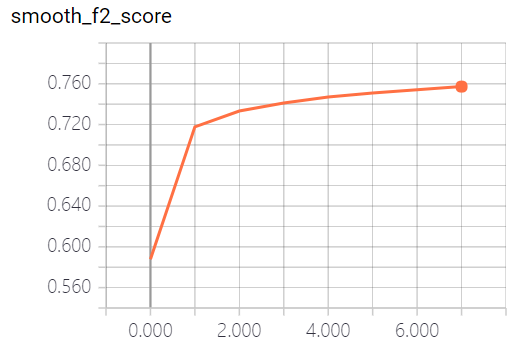
####### Smooth F2-Score is 0.746094 #######

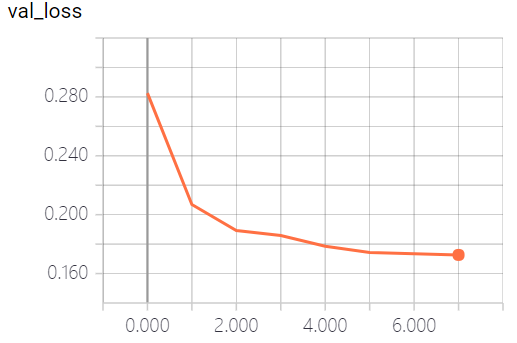
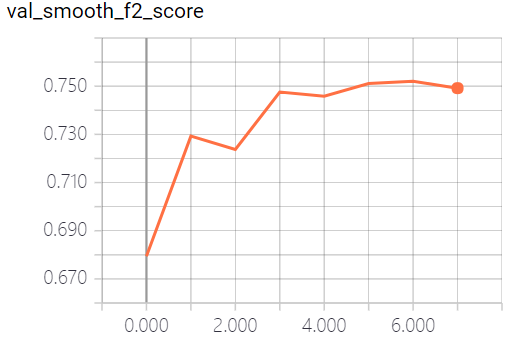
####### F2-Score with threshold 0.2 is 0.857209 #######

####### F2-Score with threshold 0.1 is 0.849872 #######

####### Greedy F2-Score is 0.860626 #######

#### Curve

增大了batch size后收敛速度很慢

## InceptionResNetV2

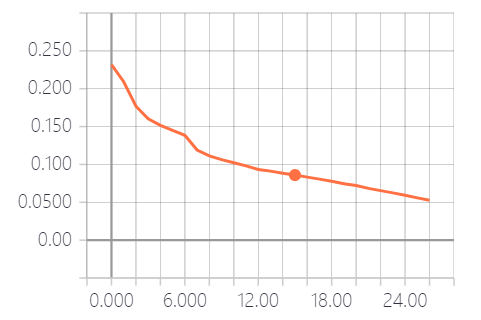
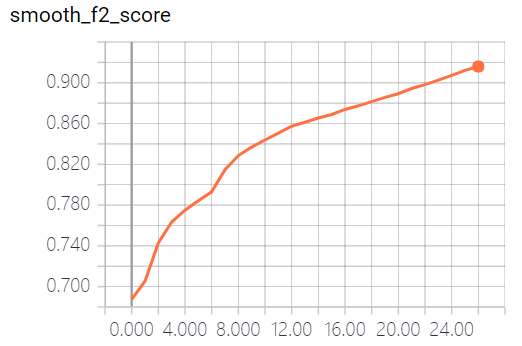
### Model 1

1. 分三阶段训练（参考ResNet50-6）
2. 并只使用Segmented数据。

#### Metric

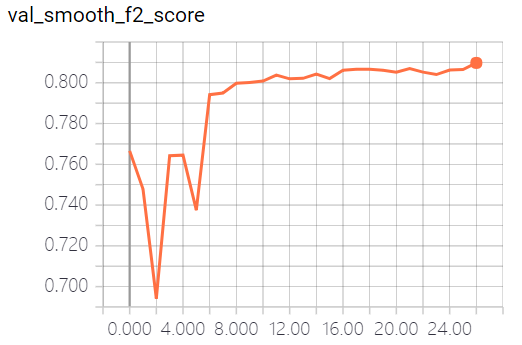
weights.007-0.7941.hdf5  
####### Smooth F2-Score is 0.790636 #######  
####### F2-Score with threshold 0.2 is 0.866281 #######  
####### F2-Score with threshold 0.1 is 0.866940 #######  
####### Best F2-Score is 0.873407 #######  
  
weights.008-0.7950.hdf5  
####### Smooth F2-Score is 0.791793 #######  
####### F2-Score with threshold 0.2 is 0.875534 #######  
####### F2-Score with threshold 0.1 is 0.874893 #######  
####### Best F2-Score is 0.880257 #######  
####### Greedy F2-Score is 0.880922 #######  
  
weights.009-0.7997.hdf5  
####### Smooth F2-Score is 0.797159 #######  
####### F2-Score with threshold 0.2 is 0.873654 #######  
####### F2-Score with threshold 0.1 is 0.875024 #######  
####### Best F2-Score is 0.878666 #######  
  
weights.010-0.8001.hdf5  
####### Smooth F2-Score is 0.799078 #######  
####### F2-Score with threshold 0.2 is 0.872105 #######  
####### F2-Score with threshold 0.1 is 0.873831 #######  
####### Best F2-Score is 0.878785 #######  
  
weights.012-0.8037.hdf5  
####### Smooth F2-Score is 0.802418 #######  
####### F2-Score with threshold 0.2 is 0.869890 #######  
####### F2-Score with threshold 0.1 is 0.873247 #######  
####### Best F2-Score is 0.877468 #######  
  
weights.014-0.8022.hdf5  
####### Smooth F2-Score is 0.800883 #######  
####### F2-Score with threshold 0.2 is 0.865996 #######  
####### F2-Score with threshold 0.1 is 0.870569 #######  
####### Best F2-Score is 0.876376 #######  
  
weights.016-0.8020.hdf5  
####### Smooth F2-Score is 0.800570 #######  
####### F2-Score with threshold 0.2 is 0.862637 #######  
####### F2-Score with threshold 0.1 is 0.868953 #######  
####### Best F2-Score is 0.874761 #######  
  
weights.018-0.8066.hdf5  
####### Smooth F2-Score is 0.805234 #######  
####### F2-Score with threshold 0.2 is 0.861564 #######  
####### F2-Score with threshold 0.1 is 0.867174 #######  
####### Best F2-Score is 0.872355 #######  
  
weights.020-0.8062.hdf5  
####### Smooth F2-Score is 0.805389 #######  
####### F2-Score with threshold 0.2 is 0.858621 #######  
####### F2-Score with threshold 0.1 is 0.864675 #######  
####### Best F2-Score is 0.870093 #######  
  
weights.022-0.8069.hdf5  
####### Smooth F2-Score is 0.805923 #######  
####### F2-Score with threshold 0.2 is 0.856163 #######  
####### F2-Score with threshold 0.1 is 0.861924 #######  
####### Best F2-Score is 0.868724 #######  
  
weights.024-0.8040.hdf5  
####### Smooth F2-Score is 0.803246 #######  
####### F2-Score with threshold 0.2 is 0.850858 #######  
####### F2-Score with threshold 0.1 is 0.859847 #######  
####### Best F2-Score is 0.867560 #######

#### Curve

在epoch=6是有一个加速，此时打开了400层以后的所有层。

随着迭代增加，模型loss持续下降，说明模型的能力足够

在epoch=8时到达loss到达最小值，然后持续增加。

从evaluate的结果来看，epoch=8处也是最优点。说明模型在8以后，过拟合了。

为什么才训练8个epoch就过拟合？

可能是因为batch size太小，相当于batch size 128训练了40个epoch

### Model 2

在Model 1的基础上做了如下修改

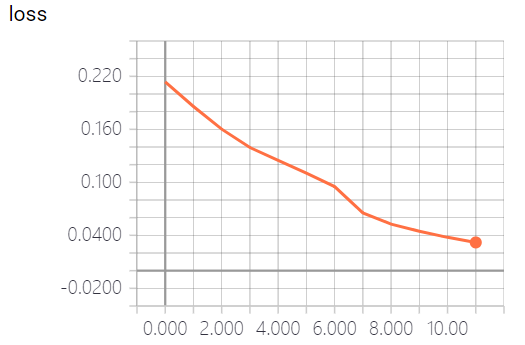
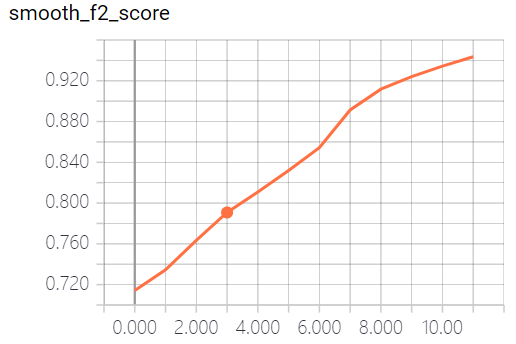
1. 使用Original数据集
2. 降低第二阶段和第三阶段的学习率（从0.0003降低到0.0001）

#### Metric

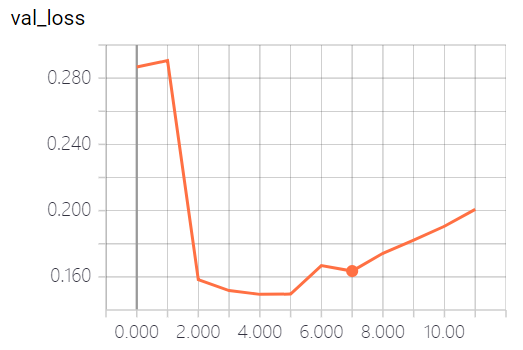
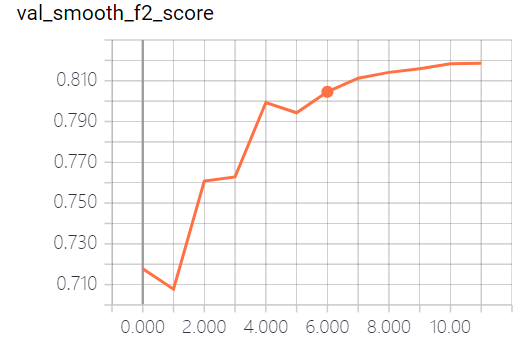
weights.006-0.7943.hdf5  
####### Smooth F2-Score is 0.787251 #######  
####### F2-Score with threshold 0.2 is 0.872325 #######  
####### F2-Score with threshold 0.1 is 0.874269 #######  
####### Basonhopping F2-Score is 0.880834 #######  
####### Greedy F2-Score is 0.882155 #######  
  
weights.007-0.8046.hdf5  
####### Smooth F2-Score is 0.802835 #######  
####### F2-Score with threshold 0.2 is 0.868019 #######  
####### F2-Score with threshold 0.1 is 0.870146 #######  
####### Basonhopping F2-Score is 0.874825 #######  
####### Greedy F2-Score is 0.876044 #######  
  
weights.008-0.8113.hdf5  
####### Smooth F2-Score is 0.806350 #######  
####### F2-Score with threshold 0.2 is 0.866478 #######  
####### F2-Score with threshold 0.1 is 0.873523 #######  
####### Basonhopping F2-Score is 0.876679 #######  
####### Greedy F2-Score is 0.878148 #######  
  
weights.009-0.8141.hdf5  
####### Smooth F2-Score is 0.809962 #######  
####### F2-Score with threshold 0.2 is 0.863204 #######  
####### F2-Score with threshold 0.1 is 0.871368 #######  
####### Basonhopping F2-Score is 0.875752 #######  
####### Greedy F2-Score is 0.877035 #######  
  
weights.010-0.8158.hdf5  
####### Smooth F2-Score is 0.812641 #######  
####### F2-Score with threshold 0.2 is 0.860696 #######  
####### F2-Score with threshold 0.1 is 0.868685 #######  
####### Basonhopping F2-Score is 0.872806 #######  
####### Greedy F2-Score is 0.875487 #######  
  
weights.011-0.8183.hdf5  
####### Smooth F2-Score is 0.813565 #######  
####### F2-Score with threshold 0.2 is 0.857980 #######  
####### F2-Score with threshold 0.1 is 0.866266 #######  
####### Basonhopping F2-Score is 0.872017 #######  
####### Greedy F2-Score is 0.873634 #######  
  
weights.012-0.8186.hdf5  
####### Smooth F2-Score is 0.813736 #######  
####### F2-Score with threshold 0.2 is 0.855675 #######  
####### F2-Score with threshold 0.1 is 0.864909 #######  
####### Basonhopping F2-Score is 0.868818 #######  
####### Greedy F2-Score is 0.872800 #######

最优值提前了几个epoch

#### Curve

和Model 1没有太大差异

在epoch=5时，loss开始反弹，而f2-score持续上升

Evaluate中epoch=6处最优，与Model 1相比，提前进入了过拟合