Results of RCNN model to Detect Charcoal Hearths. 100 randomly selected, manually scored images.

This is a notebook of results for selected models to analyse which one will be selected as the best.

```r
# Formulas from Carleton University DATA5000 lecture, Dr. James Green, Pattern
Clafficiation in the Presence of Class Imbalance
graph_result <- function(cfg_name, object_type, sample_type) {
  library("ggplot2")
  library("ggthemes")

  if(sample_type == ""){
    sample_100 = "_100"
    subtitle = "(all)"
  }else{
    sample_100 = ""
    subtitle = "(just training)"
  }

  image_prediction_folder <-
  paste0(
  '/home/student/',object_type,'/predictions/',
  cfg_name,'/unknown', sample_100, sample_type, '/edited/'
  )

  sample_file_name <- paste0(image_prediction_folder, "results_100_random_image
s", sample_type, "_", cfg_name, ".csv")
  print(sample_file_name)

  results <-
  read.table(
  sample_file_name,
  header = TRUE,
  sep = ",",
  dec = "."
  )
  results_df <- data.frame(results)

  g1p <- ggplot(results_df, aes(min_score)) +
  geom_line(aes(y = gt_obj_pres_pos , colour = "Ground Truth: Present"),
  linetype = 2) +
  geom_line(aes(y = tp , colour = "Prediction: TP")) +
  geom_line(aes(y = fp , colour = "Prediction: FP")) +
  theme_igray() +
  ggtitle(paste0(object_type," Present in Image. ",subtitle," Model: ", cfg_nam
e)) +
  xlab("Minimum Prediction Confidence Score Used") +
  ylab("Number of Occurences")+
  coord_cartesian(ylim=c(0,100))

  g1n <- ggplot(results_df, aes(min_score)) +
```

```
    geom_line(aes(y = gt_obj_pres_neg , colour = "Ground Truth: Not Present"),
    linetype = 2) +
    geom_line(aes(y = tn , colour = "Prediction: TN")) +
    geom_line(aes(y = fn , colour = "Prediction: FN")) +
    theme_igray() +
    ggtitle(paste0(object_type," Not Present in Image. ",subtitle," Model: ", cfg
_name)) +
    xlab("Minimum Prediction Confidence Score Used") +
    ylab("Number of Occurences")+
    coord_cartesian(ylim=c(0,100))


    g2 <- ggplot(results_df, aes(min_score)) +
    geom_line(aes(y = tp_box , colour = "Prediction Boxes: True Positive (TP)"))
+
    geom_line(aes(y = fp_box , colour = "Prediction Boxes: False Positive (FP)"))
+ theme_minimal() +
    theme_igray() +
    ggtitle(paste0("Prediction Regions, True vs. False Positives. ",subtitle," Mo
del: ", cfg_name)) +
    xlab("Minimum Prediction Confidence Score Used") +
    ylab("Number of Occurences")+
    expand_limits(y=0)+
    scale_y_continuous(expand=c(0,0))

    print(g1p)

    print(g1n)

    print(g2)

    results_df <- within(results_df, accuracy <- ((tp + tn) / (tp + tn + fp +
    fn)))
    results_df <- within(results_df, sn <- ((tp) / (tp + fn)))
    results_df <- within(results_df, sp <- ((tn) / (tn + fp)))
    results_df <- within(results_df, ppv <- ((tp) / (tp + fp)))
    results_df <- within(results_df, npv <- ((tn) / (tn + fn)))
    print(results_df)
    g3 <- ggplot(results_df, aes(min_score)) +
    geom_line(aes(y = accuracy , colour = "Accuracy"), linetype=2) +
    geom_line(aes(y = sn , colour = "Sensitivity/Recall/True Positive Rate")) +
    geom_line(aes(y = sp , colour = "Specificity")) +
    theme_igray() +
    ggtitle(paste0("Sensitivity and Specificity. ",subtitle," Model: ", cfg_nam
e)) +
    xlab("Minimum Prediction Confidence Score Used") +
    ylab("% Accuracy")+
```

```
    coord_cartesian(ylim=c(0,1))

    print(g3)

    g4 <- ggplot(results_df, aes(min_score)) +
    geom_line(aes(y = accuracy , colour = "Accuracy"), linetype=2) +
    geom_line(aes(y = ppv , colour =  "Positive Predictive Value")) +
    geom_line(aes(y = npv , colour = "Negative Predictive Value")) +
    theme_igray() +
    ggtitle(paste0("Predictive Value. ",subtitle," Model: ", cfg_name)) +
    xlab("Minimum Prediction Confidence Score Used") +
    ylab("% Accuracy")+
    coord_cartesian(ylim=c(0,1))


    print(g4)

}
```
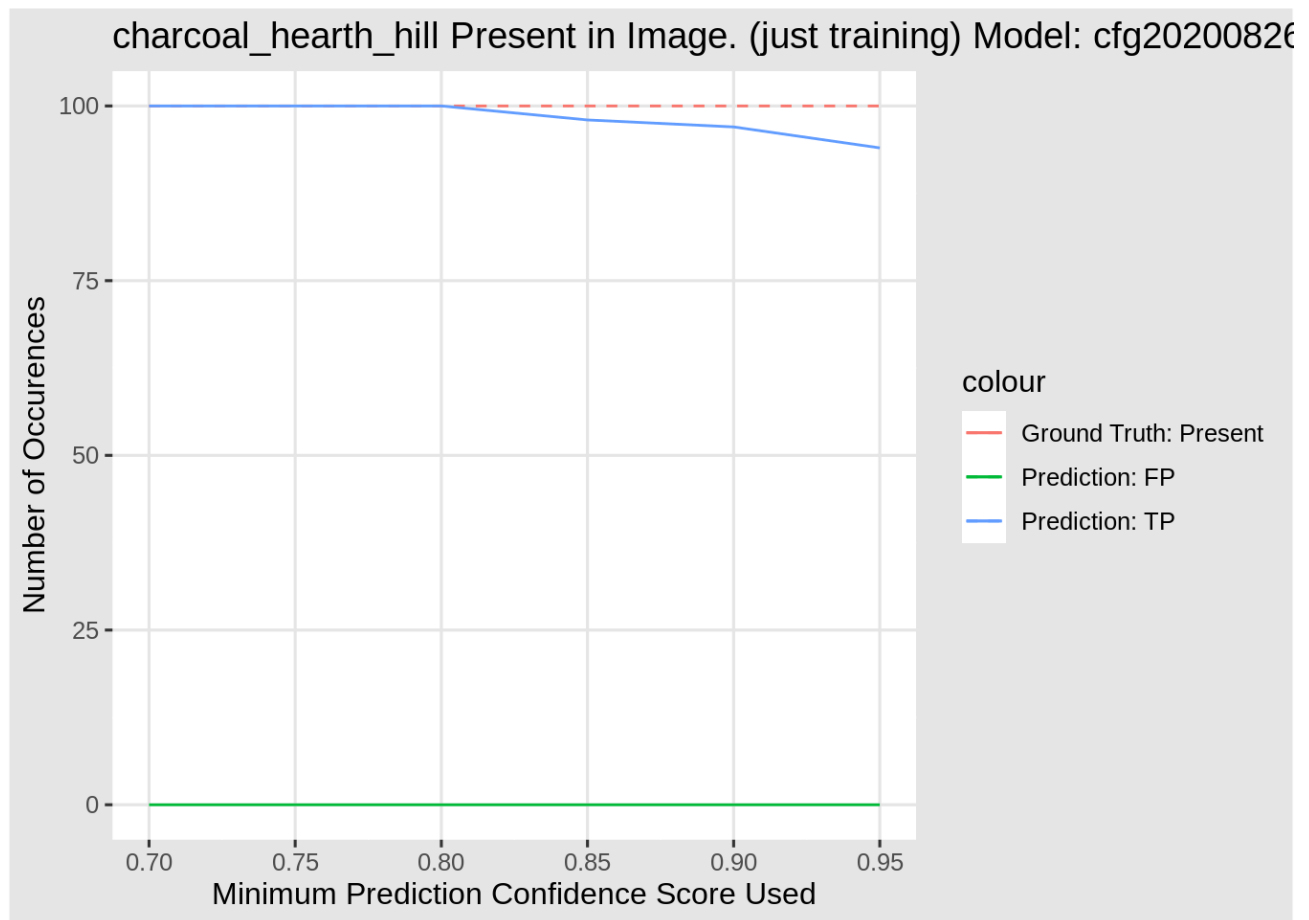
charcoal_hearth_hill
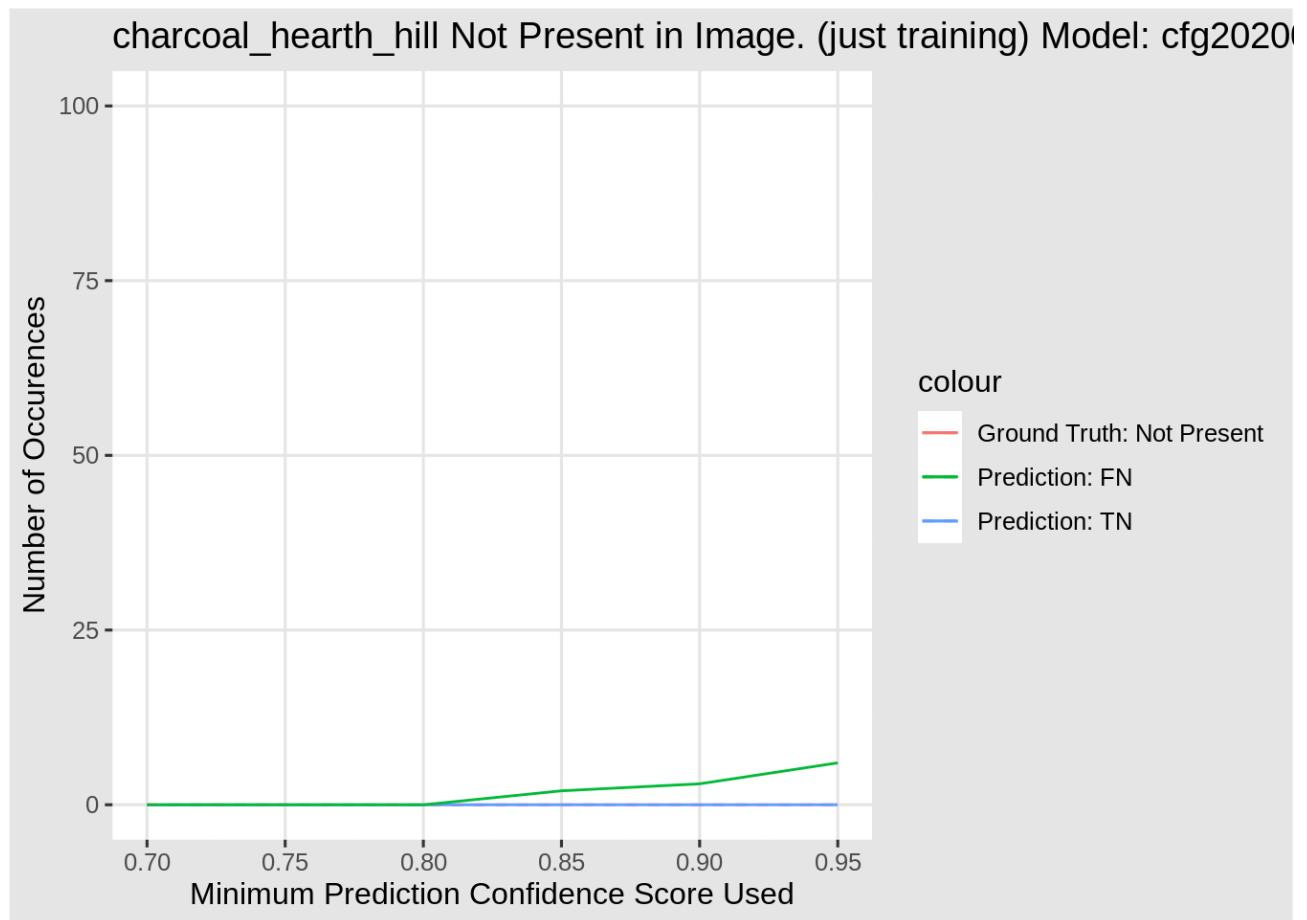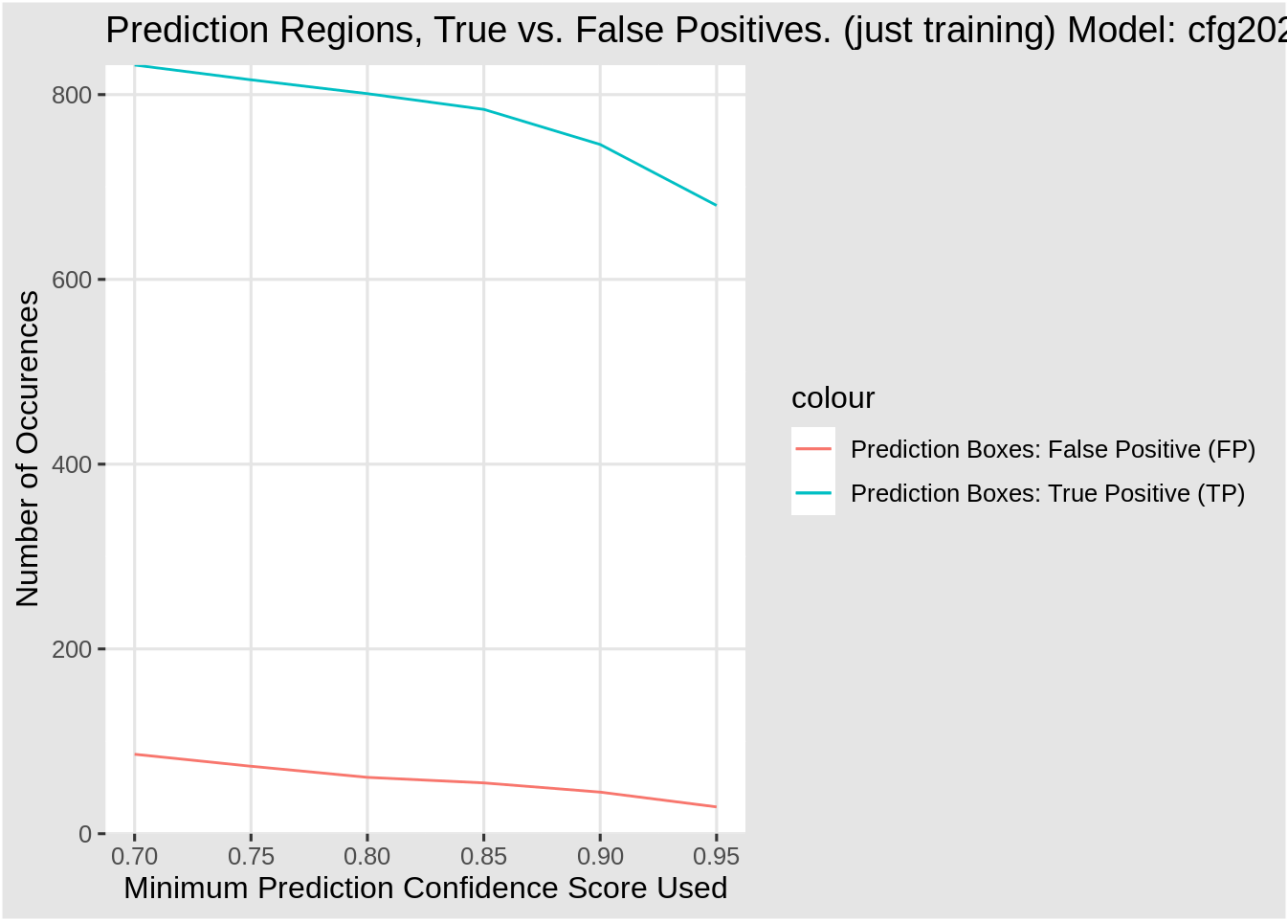
Model cfg20200826T2315

Epochs = 16

```
cfg_name <- 'cfg20200826T2315'
object_type <- 'charcoal_hearth_hill'
graph_result(cfg_name, object_type, "_training")
```

```
## [1] "/home/student/charcoal_hearth_hill/predictions/cfg20200826T2315/unknown
_training/edited/results_100_random_images_training_cfg20200826T2315.csv"
```

charcoal_hearth_hill Present in Image. (just training) Model: cfg20200826

charcoal_hearth_hill Not Present in Image. (just training) Model: cfg2020(

Prediction Regions, True vs. False Positives. (just training) Model: cfg202

```
##   min_score gt_obj_pres_pos gt_obj_pres_neg  tp fp tn fn tp_box fp_box
## 1      0.70             100                   0 100  0  0  0    832     86
## 2      0.75             100                   0 100  0  0  0    816     73
## 3      0.80             100                   0 100  0  0  0    801     61
## 4      0.85             100                   0  98  0  0  2    784     55
## 5      0.90             100                   0  97  0  0  3    746     45
## 6      0.95             100                   0  94  0  0  6    680     29
##   accuracy   sn   sp ppv npv
## 1     1.00 1.00  NaN   1 NaN
## 2     1.00 1.00  NaN   1 NaN
## 3     1.00 1.00  NaN   1 NaN
## 4     0.98 0.98  NaN   1   0
## 5     0.97 0.97  NaN   1   0
## 6     0.94 0.94  NaN   1   0
```
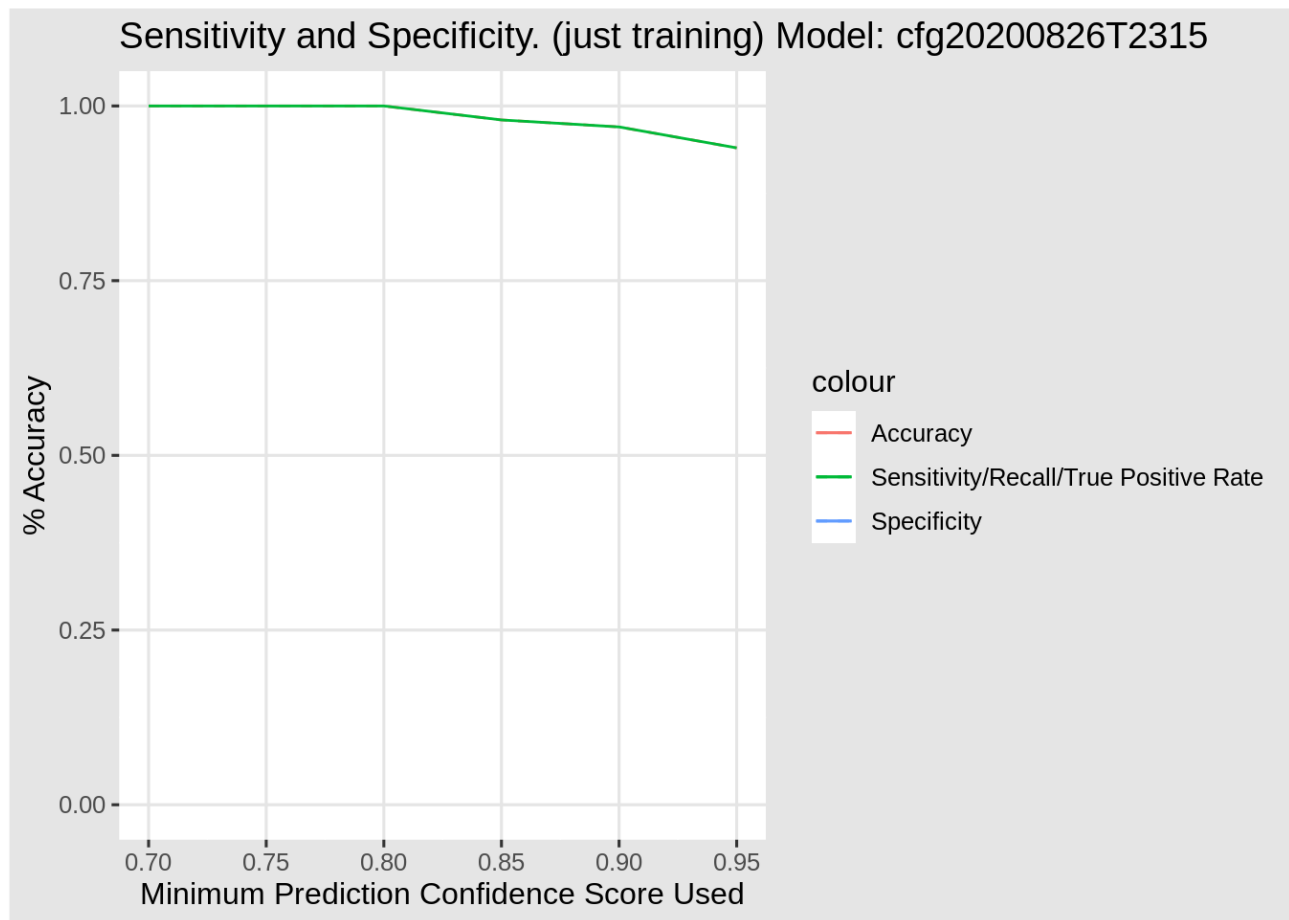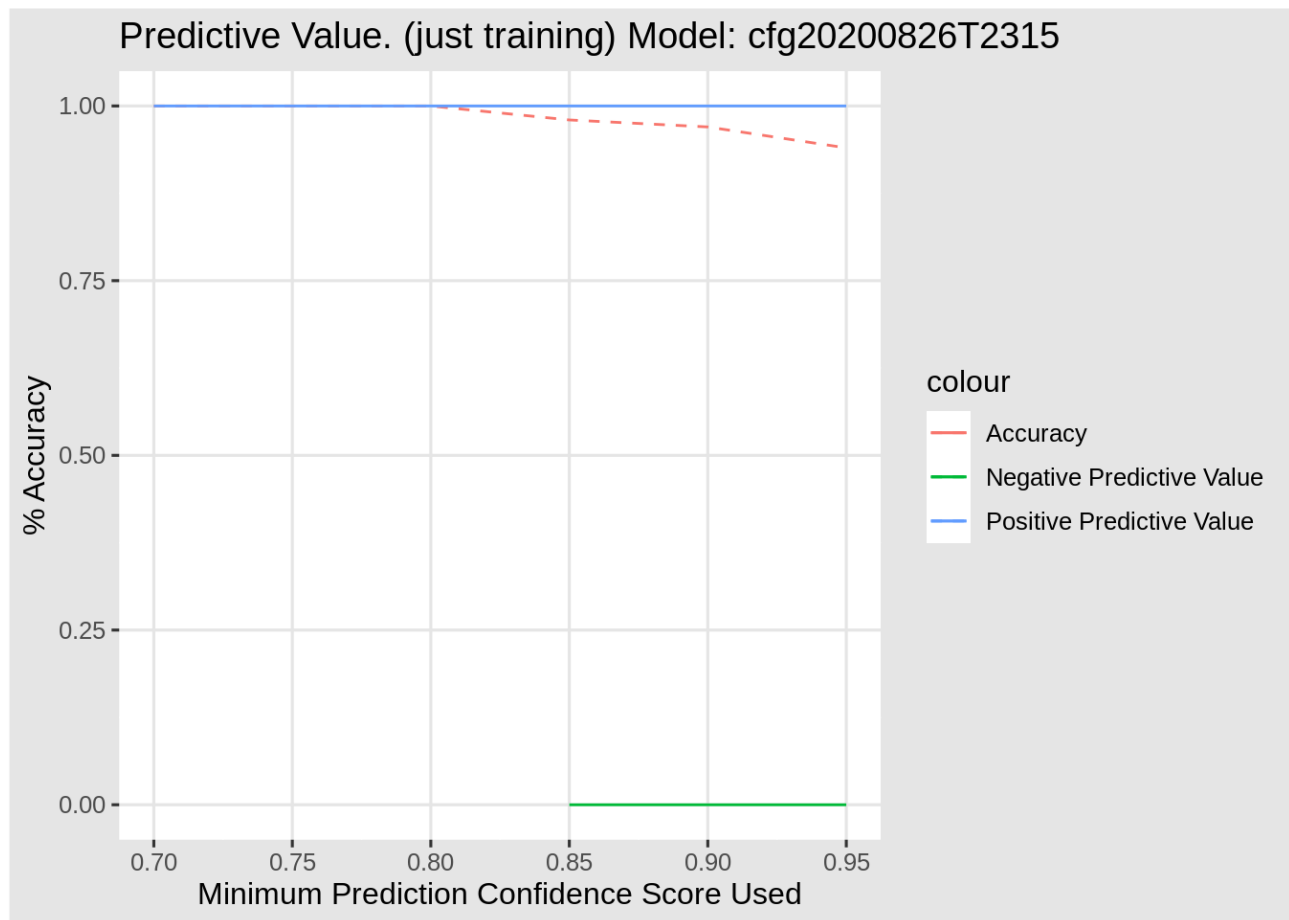
```
## Warning: Removed 6 row(s) containing missing values (geom_path).
```
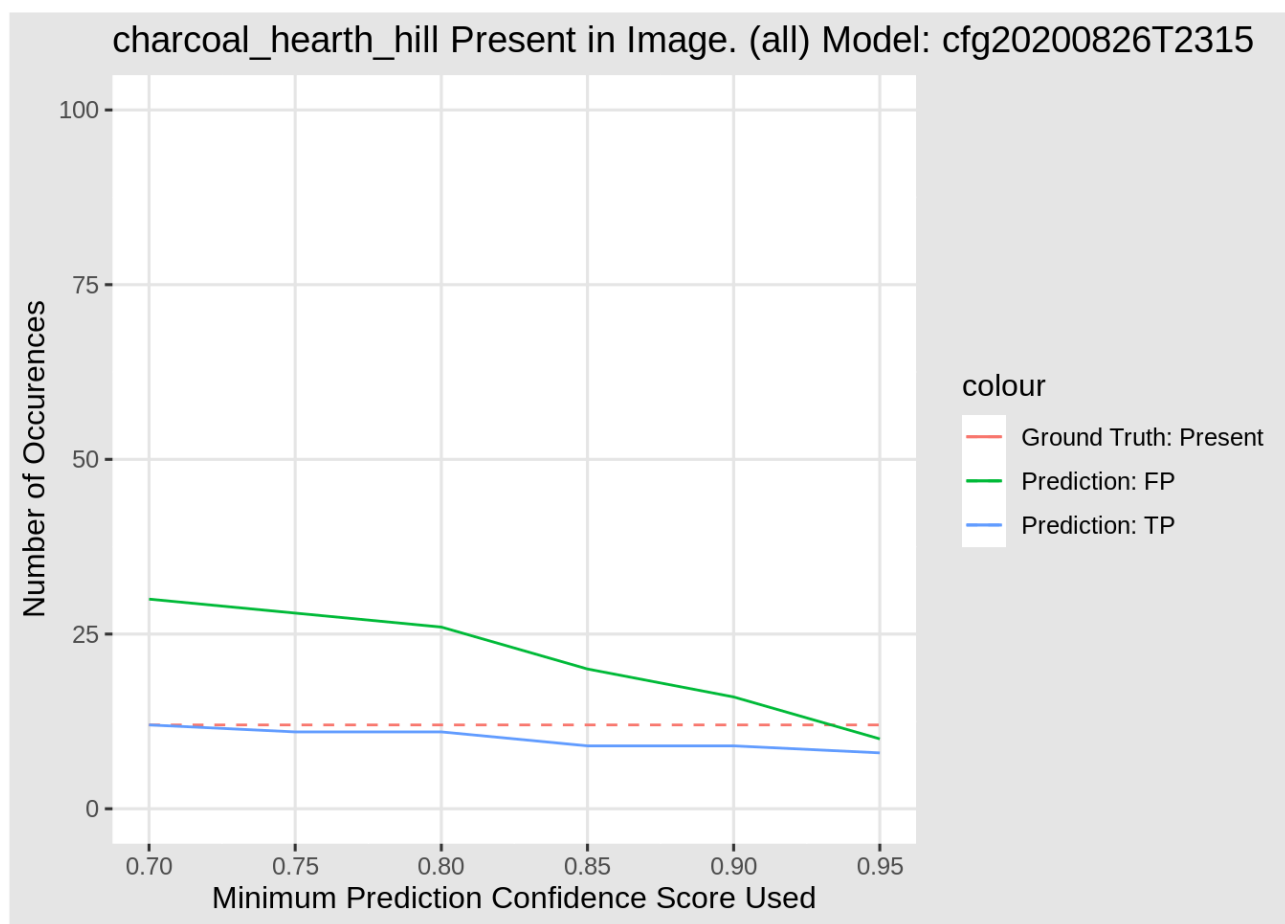
Sensitivity and Specificity. (just training) Model: cfg20200826T2315

Warning: Removed 3 row(s) containing missing values (geom_path).

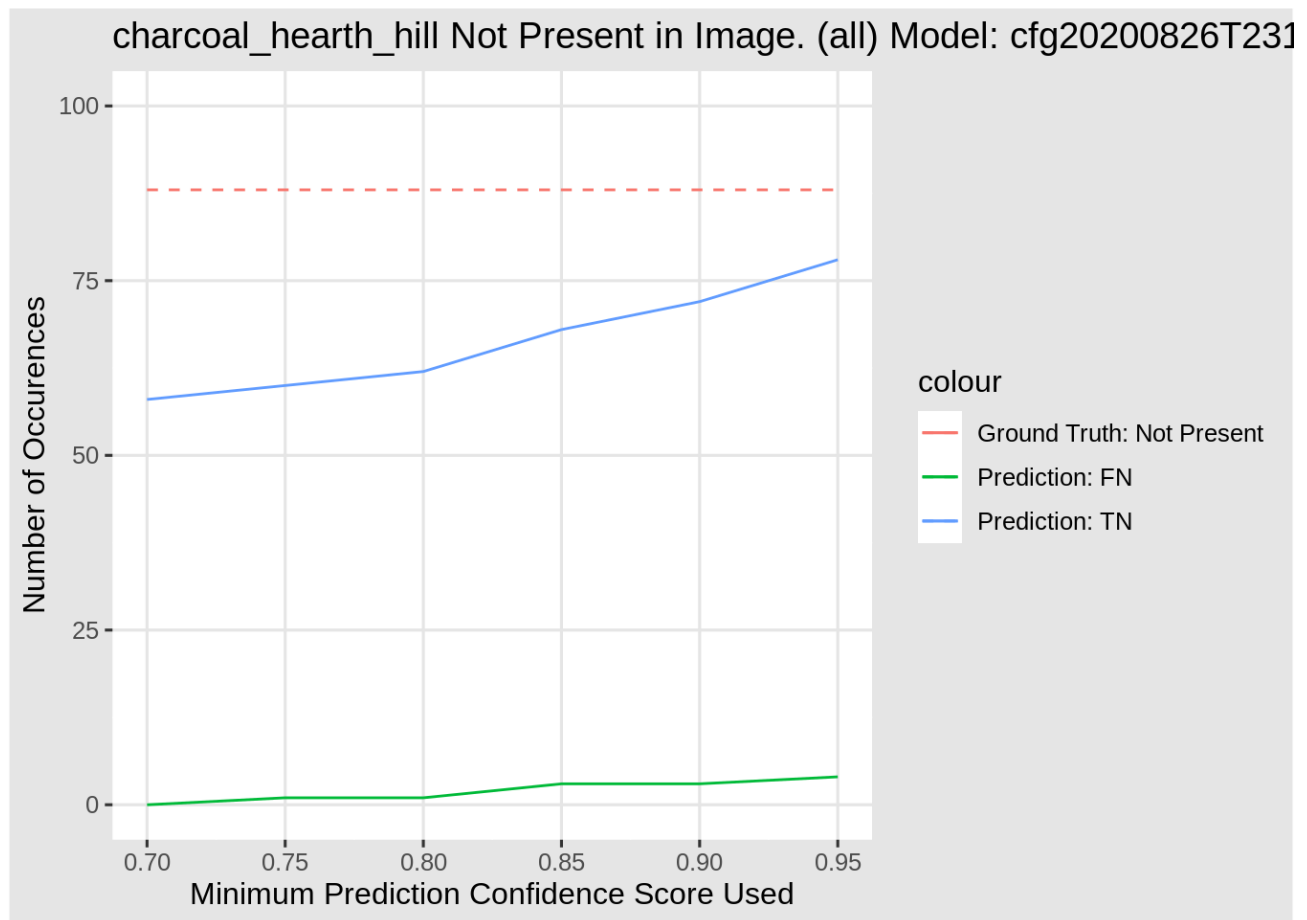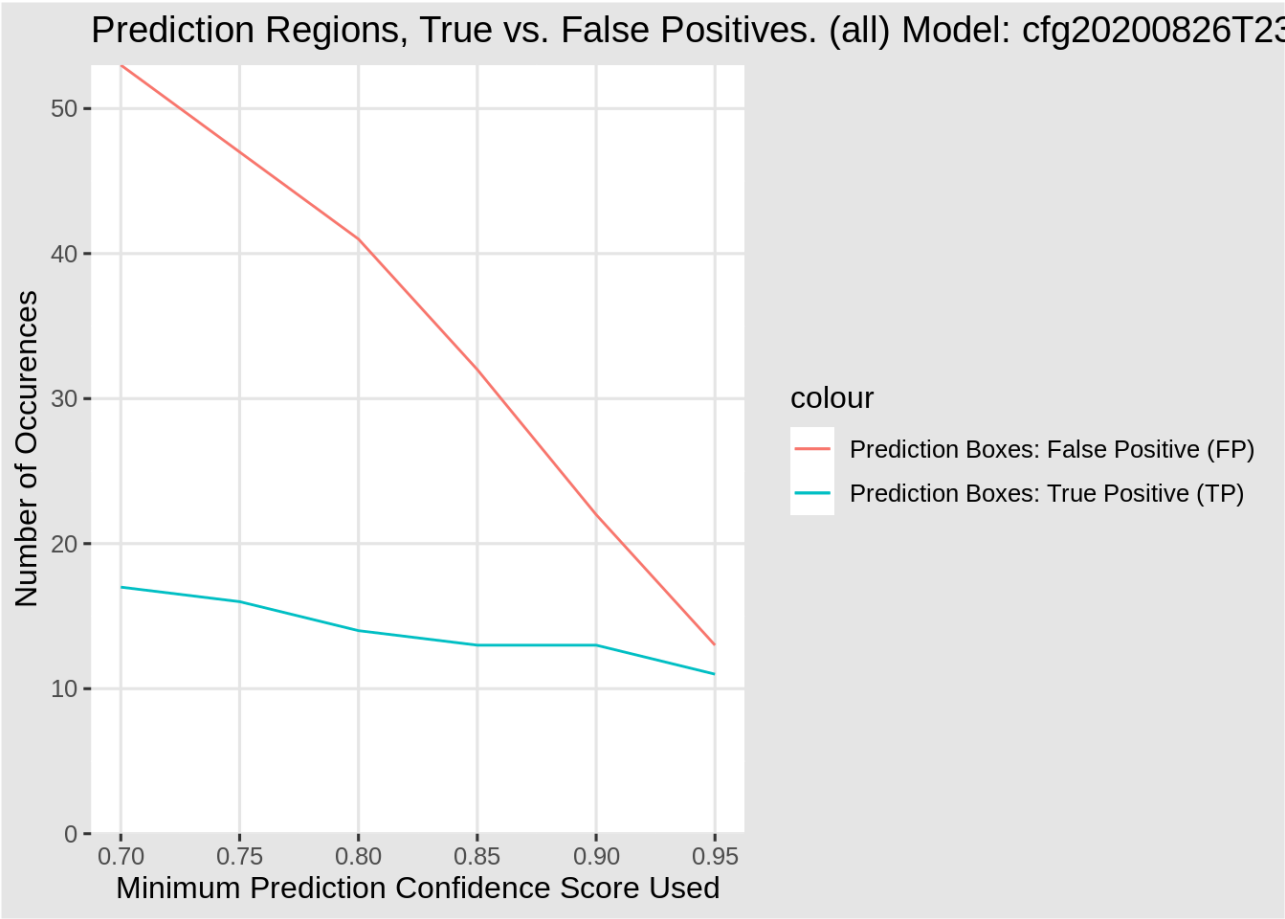## Predictive Value. (just training) Model: cfg20200826T2315


```
graph_result(cfg_name, object_type, "")
```

```
## [1] "/home/student/charcoal_hearth_hill/predictions/cfg20200826T2315/unknown
_100/edited/results_100_random_images_cfg20200826T2315.csv"
```

charcoal_hearth_hill Present in Image. (all) Model: cfg20200826T2315

charcoal_hearth_hill Not Present in Image. (all) Model: cfg20200826T231

Prediction Regions, True vs. False Positives. (all) Model: cfg20200826T23

```
##   min_score gt_obj_pres_pos gt_obj_pres_neg tp fp tn fn tp_box fp_box
## 1      0.70              12                 88 12 30 58  0     17     53
## 2      0.75              12                 88 11 28 60  1     16     47
## 3      0.80              12                 88 11 26 62  1     14     41
## 4      0.85              12                 88  9 20 68  3     13     32
## 5      0.90              12                 88  9 16 72  3     13     22
## 6      0.95              12                 88  8 10 78  4     11     13
##   accuracy        sn        sp       ppv       npv
## 1     0.70 1.0000000 0.6590909 0.2857143 1.0000000
## 2     0.71 0.9166667 0.6818182 0.2820513 0.9836066
## 3     0.73 0.9166667 0.7045455 0.2972973 0.9841270
## 4     0.77 0.7500000 0.7727273 0.3103448 0.9577465
## 5     0.81 0.7500000 0.8181818 0.3600000 0.9600000
## 6     0.86 0.6666667 0.8863636 0.4444444 0.9512195
```

Sensitivity and Specificity. (all) Model: cfg20200826T2315

Predictive Value. (all) Model: cfg20200826T2315