Q&A RAS PSC 2015. 3 issue, Version of 21 July 2015

Question 16) In the sheet 'TONNAGE_SAMPLE_DATA', there are certain rows with 0s in the columns 'Total cars traveling East', 'Total cars traveling West', 'Total number of trains traveling East' and 'Total number of trains traveling West', but 'Sum of total gross tons traveling across the section' is a positive value. Does this mean that there is a base load carried without any trains as such?

No. Some data in input might be incorrect, in principle; there are a large portion of missing or incorrect input in the dataset. It is left to the participants how to figure out/ deal with this.

Question 17) Every defect detected by a Geometry car gets a unique id. However, there are defects with the same GEO_CAR_NME and DEF_NBR but the mileposts are far from each other. For example, DEF_NBR 140. Is there a more precise definition of the defect number?

DEF_NBR is not the unique key to identify a defect, you need to consider DEF_NBR, EVT_DT, GEO_CAR_NME.

Question 18) Is it possible that a Yellow Tag shows a decrease in its amplitude without a corrective action?, or it must be assumed that without corrective actions defects increase (get worse) over time?

There might be phenomena such as measurement error or wrongly reported data in the dataset; it is left to the participants to figure out/deal with this.

Question 19) Are the corrective actions (triggered by a red flag) always successful, or they can have failures in the reparation?

The corrective action might not always successful

Question 20) In Tonnage data, what is the meaning of cars and trains? Does car mean the geometry car? Does train mean both freight and passenger train? Why the number of cars are much more than trains?
Cars are vehicle cars, i.e. wagons, for passengers or freight trains, and not only geometry cars; those latter are only those which measure the track. A train pulls multiple cars or wagons.

**Question 21)** In training data, lots of points are not recorded. For example, there is a gap between 234.36591 and 234.39413. Should we consider the points between these two numbers as normal data (no tag) or unknown data?

You can consider it as no tag. Moreover, be aware that there might be human input error for data, such as line segment # and milepost.

**Question 22)** In the testing data, does the “INTERVAL” column mean we need to predict this defect tag counting from the inspection time? For example, if the start date is 09Apr2013 and interval is 3 days, does it mean we need to predict whether the tag is yellow or red at 12 Apr 2013 (i.e. 3 days after 2013/04/09)? If our understanding in previous sentences is true, does it imply that each listed position (i.e. row) recorded in the excel file has to be yellow in the first place (so that we only need to predict whether it would become red or not)?

Yes.

**Question 23)** In the training data graph, the graph has “Crossover” attribute of TRACK_SDK_NBT column. What is the code number for “Crossover”?

Crossover is track segments number, just like 0 indicating single track. In the dataset, we only extract mainline data subset, so the crossover is just helping to understanding, does not matter much to the data analysis.

**Question 24)** The column TRACK_SDK_NBT says every track has single track line or multiple track lines. Could a track have both a single track line and multiple track lines at the same time?

No.
Question 25) Follow the Question 8 in the Q&A RAS PSC 2015. Version of 8 July 2015. In training data row 222 and 223, they have different color tags at the same time and position. In this case, should we consider this milepost as red or yellow? Furthermore, if this is the result of right and left rails (so that they have different colors), what (right rail? left rail? or?) should we use in our prediction?

How to deal/handle multiple tags at the same location is left to the participants.
Q&A RAS PSC 2015. 2 issue, Version of 13 July 2015

Question 13): What is the difference between “LINE_SEG_NBR” and “TRACK_SDTK_NBR”? Is our understanding as shown below correct?

- **LINE_SEG_NBR**: Defines from place A to place B
- **TRACK_SDTK_NBR**: Defines the track among the multiple tracks

The interpretation is correct.

Question 14) In ‘Training dataset’, what do two rows in the sheet with same defect number mean. The types of defects are ‘Dip’ and ‘Surface’ respectively.

Question 14) When does the same defect number get allocated to multiple instances in the data sheet?

**DEF_NBR** is not the unique key to identify a defect, you need to consider **DEF_NBR**, **EVT_DT**, **GEO_CAR_NM**.

Question 15) What are the units for the column ‘MILE POST’? (Miles/km)?

Miles.
Q&A RAS PSC 2015. Version of 8 July 2015

Question 1): We found a puzzle about TONNAGE_SAMPLE_DATA in the RAS PSC - Training dataset file. The TONNAGE_SAMPLE_DATA only exists when LINESEG_NBR=4. However, we need all the TONNAGE_SAMPLE_DATA to obtain an algorithm. Is the data just like this or the other TONNAGE_SAMPLE_DATA hasn’t been given?

Question 1) The TONNAGE_SAMPLE_DATA has no information for LINESEG_NBR 1, 2, and 3. Did we miss anything?

Question 1) Why is tonnage data only provided for line 4?

This was a data masking issue about the TONNAGE_SAMPLE_DATA. We updated the excel file with the correct data. (July 7)

Question 2): The zip file in https://www.informs.org/Community/RAS/Problem-Solving-Competition/2015-RAS-Problem-Solving-Competition is the only set of data that will be provided for the competence?

Yes. All data is available via the excel files.

Question 3) Is there information of when a corrective action was performed in any point of the track?

The text states that Repairs for yellow tag defects are not always recorded in the database. In general, thus, a red tag will trigger a corrective action, a yellow tag might, or might not, and this latter information is unavailable to the competition.

Question 4) What is the maximum separation between measures for which it can be assumed that it is the same defect in the track?

Question 4) To track the degradation of a given defect, do successive runs need to mark it at the exact same spot?

The text now reports on geographical repetition:
A defect found in the same location as a defect from the previous test may be flagged as a repeat defect. Defects must be from the same defect type and found within 100 feet on either side of a previous defect to be considered a repeat defect.

For temporal repetition, any two defects happening at the same location (in the sense of the first half of this answer), however far they are separated in time, they will be considered as the same.

We normally consider two inspection runs beyond 7 days’ time window as consecutive inspections runs, if two inspection runs are within 7 days, they are considered in the same inspection run.

Even if a corrective action has been carried out, the yellow tags might not be 100% repaired. There are no maintenance data (correction data) available, since the corrective action for yellow tags might or might not recorded.

**Question 5)** I have some ambiguities in the RAS problem competition data. In the overview you give an example of a data samples:

- Yellow tag @milepost 12.000, 1 Feb
- Yellow tag @milepost 12.000, 1 Apr
- Yellow tag @milepost 12.000, 1 Sep
- Red tag @Milepost 12.000, 18 Oct

The same milepost value is repeated in four samples but in the training dataset the inspection is done one time only for many milepost values. My question is: Can I consider the milepost "7,03336" the same as the milepost "7,03509" and if the differentiation of these values is related to columns milepost_start and milepost_end?

We say that: “A defect found in the same location as a defect from the previous test may be flagged as a repeat defect. Defects must be from the same defect type and found within 100 feet on either side of a previous defect to be considered a repeat defect.”

**Question 6)** Is Yellow/Red tag determined by defect amplitude alone or by amplitude and length together? Besides, what is the threshold for determining whether a certain type of track geometry defect is Yellow or Red? Our perception is that each railroad may have its own engineering standards to classify track defects (yellow versus red). We wonder if this information is available to us.

**Question 6).** What are the thresholds used in the training data for RED and YEL tag?

How to determine precisely a yellow tag and red tag is sketched in the document. This information is actually not necessarily relevant, as the determination of yellow or red tag is
performed already in the data. The standards used might be different than the standard of a (another) particular railway company. Precisely, the following are the Yellow/Red limits to determine defect priority. However, these threshold are subject to change with time.

<table>
<thead>
<tr>
<th>As of 09/01/2013</th>
<th>Geometry Car Red and Yellow Tag Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Speed</td>
<td>Class 1: P15/F10 Class 2: P30/F25 Class 3: P60/F40 Class 4: P80/F60 Class 5: P90/F80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surface 62 (Left and Right)</th>
<th>Red</th>
<th>3&quot;</th>
<th>2 3/4&quot;</th>
<th>2 1/4&quot;</th>
<th>2&quot;</th>
<th>1 1/4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>2 3/4&quot;</td>
<td>2 1/2&quot;</td>
<td>2&quot;</td>
<td>1 3/4&quot;</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>Dip31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>3&quot;</td>
<td>2 3/4&quot;</td>
<td>2 1/4&quot;</td>
<td>1 3/4&quot;</td>
<td>1 1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>2 1/2&quot;</td>
<td>2 1/4&quot;</td>
<td>1 3/4&quot;</td>
<td>1 1/2&quot;</td>
<td>1 1/4&quot;</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Crosslevel</th>
<th>Red</th>
<th>3&quot;</th>
<th>2&quot;</th>
<th>1 3/4&quot;</th>
<th>1 1/4&quot;</th>
<th>1&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>2 3/4&quot;</td>
<td>1 3/4&quot;</td>
<td>1 5/8&quot;</td>
<td>1 1/8&quot;</td>
<td>7/8&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Question 7)** There are four tracks in the problem. Are those tracks identical or they have different characteristics (e.g., rail age, engineering design)?

The rail age and engineering design information are not available, but they are supposed to be different at least in location.

**Question 8)** For the dip and cross level defects, we wonder why the same location can have two different defects measurement on the same date. For example, on row 419 & 420 of the training dataset (both from milepost 9 of line segment 2 on Apr 4, 2013) show two cross level defects at the same location. Similarly, row 2738 & 2739 (both from milepost 5 of line segment 2 on Aug 18, 2013) show two different dip defects at the same location (please see the table below).
Question 8). Data shows several instances where two SURF defects are shown at the same spot on the same day. Are these for Left and Right rail independently?

The track geometry car might run across the same location multiple times at the same day. Two or more inspection runs within 7 days (including the same day) are considered the same inspection run.

Moreover, the defect might came from the left and right rail or came from the same rail.

Question 9) From the problem statement, we understand that the surface defect can be either on the left rail or the right rail. In the training dataset, is there any information tell us whether a defect is on the left versus right rail?

Question 9). Data shows several instances where two SURF defects are shown at the same spot on the same day. Are these for Left and Right rail independently?

No. The track (both rails) will be deemed as yellow tag or red tag, if any or both of the two rails are not according the standard.

Question 10) How is defect length determined? How to report the milepost within defect length (e.g., the milepost is the middle point of the defect length, or it is the starting or ending point of defect length?)

The milepost is the location where the defect is measured the worst.
Question 11) Again in the TONAGE_SAMPLE_DATA, some rows contain total gross tons but do not have information regarding total number of cars traveling east/west, or zero total trains traveling east/west. Do we have to infer the number of trains and cars?

Participants are free to either infer the number of trains and cars or not.

Question 12) Many mileposts have only one inspection record within the study period. Therefore, we consider aggregating some small segments in the training dataset into a larger track lot. Is there any specified aggregation length we need to use (e.g., 0.01 mile or 0.1 mile?)

No fixed specified aggregation length is suggested.

Question 13) What is the 'length' of a defect? Is it measured +/-0.5 Length, or point to point + Length?

We are not provided the detailed information how to get the “length”. The operator uses the length which is beyond the yel/red threshold, and based on the consecutive yel/red tags, they might chain or group some tags together to have a combined defect length.

Question 14) Why are SURF defects all negative and DIP all positive?

Theoretically, both SURF and DIP can be either negative or positive. The sampled dataset is consistent with the original dataset.

Question 15) There seem to be inconsistencies in inspection mileposts data. Ideally, there should not be any other track over span of a single track (TRACK_SDTK_NBR = 0). But, the data set have those entries. For example line1, track segment 0, 1 and 2 spans over 0-226.09, 199.28-203.2, 199.28-203.2 respectively

It is not inconsistencies, it is due to the parallel track segments.