Problem: An unknown dog wanders the neighbourhood every night, scavenging in people’s garbage pails and making a mess. Four of the kids in the neighbourhood (Mathias, Li Jing, Rajiv, and Olivia) think they have each seen the guilty dog, but the culprit is hard to see clearly in the dark.

Below are their descriptions, each giving exactly four details about the dog: the dog’s colour, hair type, collar colour, and tail length.

Each witness has exactly one of the four details correct in their description. Each detail is described correctly by exactly one of the four witnesses.

1. Mathias says the dog is white, fluffy, wears a red collar, and has a long tail.
2. Li Jing says the dog is black, has short hair, wears a red collar, and has a long tail.
3. Rajiv says the dog is brown, has long hair, wears a blue collar, and has a long tail.
4. Olivia says the dog is spotted, fluffy, wears a red collar, and has a short tail.

Determine the correct description of the guilty dog.

Solution:

Here is the completed table of details.

<table>
<thead>
<tr>
<th>Child</th>
<th>Colour</th>
<th>Hair Type</th>
<th>Collar Colour</th>
<th>Tail Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathias</td>
<td>white</td>
<td>fluffy</td>
<td>red</td>
<td>long</td>
</tr>
<tr>
<td>Li Jing</td>
<td>black</td>
<td>short</td>
<td>red</td>
<td>long</td>
</tr>
<tr>
<td>Rajiv</td>
<td>brown</td>
<td>long</td>
<td>blue</td>
<td>long</td>
</tr>
<tr>
<td>Olivia</td>
<td>spotted</td>
<td>fluffy</td>
<td>red</td>
<td>short</td>
</tr>
</tbody>
</table>

Noting that each witness can only be right about one detail, and each detail is described correctly by only one witness, we reason as follows (in the order indicated by the numbered items in the table).

1. Since exactly one of the witnesses has the tail length correct, it must be Olivia’s description of the tail length that is correct. This means the dog must have a short tail.
2. Since exactly one of the witnesses has the collar colour correct, it must be Rajiv’s description of the collar colour that is correct. This means the dog must have a blue collar.
3. Since Rajiv and Olivia can only be correct about one detail each, based on the work above we know they must both be wrong about the hair type of the dog. This means that the dog’s hair cannot be long and cannot be fluffy. Since one of the witnesses has the hair type correct, it must be Li Jiang who has it correct, and so the dog’s hair must be short.
4. Based on the work above, we know Matias is wrong about tail length, collar colour, and hair type. Since Matias must have one detail correct, it must be the colour. This means the dog must be white.

Thus we conclude that the dog is a white, short-haired dog with a short tail, wearing a blue collar.