**Diabetic Retinopathy**

<https://www.mayoclinic.org/diseases-conditions/diabetic-retinopathy/symptoms-causes/syc-20371611?page=0&citems=10>

Diabetic retinopathy is a diabetes complication that affects eyes. It's caused by damage to the blood vessels of the light-sensitive tissue at the back of the eye (retina).

Diabetic retinopathy may cause no symptoms or only mild vision problems. Eventually, it can cause blindness. Lack of showing the symptoms in the initial stage is a risk compared to other diseases in the current world. The other diseases may show direct related symptoms to the disease and will eventually lead the patient to a doctor by himself in the initial stage.

**When to see a doctor**

Careful management of diabetes is the best way to prevent vision loss. If you have diabetes, channel an eye doctor for a yearly eye exam with dilation - even if the vision seems fine. Pregnancy may worsen diabetic retinopathy, so if you're pregnant, your eye doctor may recommend additional eye exams throughout your pregnancy.

Contacting eye doctor right away is also highly recommended if vision changes suddenly or becomes blurry, spotty or hazy.

A person might not have symptoms in the early stages of diabetic retinopathy. As the condition progresses, diabetic retinopathy symptoms may include:

* Spots or dark strings floating in your vision (floaters)
* Blurred vision
* Fluctuating vision
* Impaired color vision
* Dark or empty areas in your vision
* Vision loss

Diabetic retinopathy usually affects both eyes.

Causes

Over time, too much sugar in your blood can lead to the blockage of the tiny blood vessels that nourish the retina, cutting off its blood supply. As a result, the eye attempts to grow new blood vessels. But these new blood vessels don't develop properly and can leak easily.

There are two types of diabetic retinopathy:

**Early diabetic retinopathy**

In this more common form — called nonproliferative diabetic retinopathy (NPDR) — new blood vessels aren't growing (proliferating).

**Advanced diabetic retinopathy**

Diabetic retinopathy can progress to this more severe type, known as proliferative diabetic retinopathy. In this type, damaged blood vessels close off, causing the growth of new, abnormal blood vessels in the retina, and can leak into the clear, jelly-like substance that fills the center of your eye (vitreous).

**Risk factors**

Duration of diabetes — the longer you have diabetes, the greater your risk of developing diabetic retinopathy

Poor control of your blood sugar level

High blood pressure

High cholesterol

Pregnancy

Tobacco use

Being African- American, Hispanic or Native American

<https://www.sciencedirect.com/science/article/pii/S0161642003004755>

<https://care.diabetesjournals.org/content/27/suppl_1/s84>

<https://www.sciencedirect.com/science/article/pii/S0161642081349781>

<https://www.mayoclinic.org/diseases-conditions/diabetic-retinopathy/symptoms-causes/syc-20371611?page=0&citems=10>

The dataset is included with all the attributes fully named. The dataset includes ### number of data with 19 attributes.

Each data is consisted with all attribute reading included with no reading missing values. With no much variation of the data.

The following will elaborate on the dataset variation per each of the data in the dataset.

Therefore, the simple conclusion is to not to process the data cleaning since there is no missing values in the dataset.

Moreover, there are no obsolete value with very large variation of the other readings for the same attribute ( e.g.- attribute 7 has maximum value of 89, minimum value of 1 along with a mean of 21.151173. Nevertheless, the standard deviation is 15.101560. therefore, it is acceptable to have a range from 1 to 89 in the dataset for the attribute 7).

Eventually, the process of cleaning data is not used here as a conclusion from the dataset statistics.

The machine learning processes followed are giving quite different readings and the outputs are matched with the confusion matrix. The models used separately.

* SVM
* Random Forest Classifier