Project Design Phase-I
Proposed Solution Template

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TEAM ID	**PNT2022TMID47257**
PROJECT NAME	**EARLY DETECTION OF CHRONIC KIDNEY DISEASE USING MACHINE LEARNING**
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MAXIMUM MARKS	**2**

PROPOSED SOLUTION:

SOLUTION FIT:

ABSTRACT:

Chronic Kidney Disease (CKD) is a major medical problem and can be cured if treated in the early stages. Usually, people are not aware that medical tests we take for different purposes could contain valuable information concerning kidney diseases. Consequently, attributes of various medical tests are investigated to distinguish which attributes may contain helpful information about the disease. The information says that it helps us to measure the severity of the problem and we make use of such information to build a machine learning model that predicts Chronic Kidney Disease.

FAST FACTS ABOUT CHRONIC KIDNEY DISEASE:

- Early chronic kidney disease has no signs or symptoms – many people living with CKD don’t even know it until the disease is in an advanced stage.

- About 10% of the adult population is living with some degree of CKD, and every year millions die prematurely from CKD and related complications.
- CKD is a major risk factor for cardiovascular diseases, which are the primary cause of death for all people living with CKD.
- If CKD is detected early and managed appropriately, the deterioration in kidney function can be slowed or even stopped, and the risk of associated cardiovascular complications can be reduced.
- CKD is largely preventable, and can be detected early with simple blood and urine tests.

CHRONIC KIDNEY DISEASE:

Chronic kidney disease is a progressive loss of kidney function over a period of months or years. Our kidneys work to keep us healthy by cleaning wastes from our blood with millions of tiny filters, called nephrons. If these nephrons are damaged, they begin to shut down. Eventually, there are not enough left to filter our blood well enough to keep us healthy and we begin to feel the symptoms of CKD. However, by the time we notice the symptoms, CKD is usually at an advanced stage. In fact, a person can lose up to 90% of their kidney function before experiencing any symptoms at all. This is why one in ten people are living with CKD, but most of them don't even know it.

Left untreated, CKD progresses from Stage 1 through to Stage 5. Stage 5 is also known as End-Stage Renal Disease (ESRD), which means regular dialysis treatment, or a kidney transplant is needed to survive.

Symptoms and complications of CKD may include:

- High blood pressure
- Anaemia (low blood count)
- Weak bones
- Poor nutritional health
- Nerve damage
- Swollen ankles
- Fatigue

Another consequence of CKD is that it increases the risk of early death from associated cardiovascular disease (i.e. heart attacks and strokes). People living with CKD therefore have an increased risk of dying prematurely from cardiovascular disease, regardless of whether they ever develop kidney failure.

CAUSES AND RISK FACTORS FOR CHRONIC KIDNEY DISEASE:

Hypertension and diabetes are the most common causes of kidney disease, with hypertension causing just over a quarter of all cases of kidney failure and diabetes causing one third of them. Between 2005 and 2015, the prevalence of diabetic kidney disease increased by 39.5% globally.

In Mexico, the country with the highest CKD death rate in the world, more than half of all cases of Stage 5 CKD were attributable to diabetes.

Other much less common conditions that can cause CKD include inflammation, infections, genetics, or longstanding blockage to the urinary system (such as enlarged prostate or kidney stones).

PREVENT CHRONIC KIDNEY DISEASE:

CKD is a silent killer, but it can usually be prevented. There are several ways to reduce the risk of developing kidney disease.

- Be active
- Eat a healthy diet
- Reduce your salt intake
- Don't smoke
- Check and control your blood sugar and blood pressure as part of your regular checkups
- Get your kidney function checked if you have one or more of the 'high risk' factors: diabetes, hypertension, obesity, a family history of CKD.

DIAGNOSE AND TREAT CHRONIC KIDNEY DISEASE:

Blood and urine tests can easily detect CKD and simple, low-cost treatments can slow the progression of the disease, reduce the risk of associated heart attacks and strokes, and improve quality of life.

The early detection of failing kidney function can be lifesaving, because it allows CKD to be treated through medications, diet, and lifestyle changes rather than dialysis or a kidney transplant, which are economically inaccessible for most people around the world. These treatments are known as renal replacement therapies (RRT) because they attempt to "replace" the normal functioning of the kidneys.

When you have kidney failure, wastes and fluids accumulate in your body and you need regular dialysis treatments for life to remove these wastes and excess fluid from your blood. For patients who can access it, a kidney transplant combined with medications and a healthy diet can restore normal kidney function.

ECONOMIC COSTS:

The cost of treating CKD represents an enormous burden on healthcare systems worldwide. In developed countries, kidney failure is a major cost driver for patients, their families and governments. For instance:

According to a recent report published by NHS Kidney Care, in England, CKD costs more than breast, lung, colon and skin cancer combined.

In the US, treatment of CKD is likely to exceed USD 48 billion per year, and the Stage 5 program consumes 6.7% of the total Medicare budget to care for less than 1% of the covered population.

In middle-income countries, access to life-saving therapies has progressively increased, yet renal replacement therapy (dialysis or transplant) remains unaffordable for the vast majority of patients.

Developing countries cannot afford dialysis or transplants at all—resulting in the deaths of over 1 million people annually from untreated kidney failure.It is clear that we are not all equal with regard to kidney disease and access to treatment.

ABOUT THE PROJECT:

Chronic kidney disease (CKD) is an important public health problem and has been recognized as a national health priority. It is defined by the presence of kidney damage or reduced kidney function for a period of at least 3 months. The level of disease severity has been used to classify CKD into various stages, from persistent kidney damage only (stage 1) to mild reduction in kidney function (stage 2) to moderate to severe reduction in kidney function (stage 3 and 4). Stage 5 refers to the advanced stage of CKD also termed “kidney failure,” which can progress to end-stage renal disease (ESRD), a term that implies kidney failure has reached the point of requiring dialysis therapy or kidney transplantation to maintain life.

Patients with CKD suffer considerable morbidity as well as high rates of mortality. Kidney disease consistently ranks within the top 10 causes of death in the nation. While progression to ESRD is a well-known and serious complication of CKD, it is now well-recognized that premature death and morbidity (especially cardiovascular morbidity) are far more frequent outcomes compared to ESRD. Despite the tremendous impact of CKD on health, quality of life, and health care costs, the United States has thus far not developed a comprehensive, systematic surveillance program to monitor this important condition. Such a system would help not only in documenting the burden of CKD and its risk factors in the U.S. population over time, but also in tracking the progress of our efforts to prevent, detect, and manage CKD and its complications. It would also provide the means for evaluation, monitoring and implementation of quality improvement efforts by both federal and non-federal agencies. The CKD Surveillance Project was designed and implemented to address these issues.