A DWT-Utilized Classifier for UPJO Diagnosis Using Ultrasound Images

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Abstract:
Ureteropelvic Junction Obstruction (UPJO) is a common hydronephrosis disease in children that can result in even progressive loss of renal function. Ultrasonography as a preliminary diagnostic step for UPJO has the nature of economical, radiationless, noninvasive, and high-noise. Artificial intelligence has been widely applied to medical fields and can greatly assistant for doctors' diagnostic ability. We build and test a DWT-utilized classifier for UPJO diagnosis using ultrasound images. Our diagnosis model is a combination of an attention-based pyramid semantic segmentation network and a discrete wavelet transformation processed residual classification network. We also compare the performance between benchmark models and our models. Our diagnosis model outperformed benchmarks on classification task with accuracy=91.77%. This model can automatically grade the severity of UPJO by ultrasound images, assistant for doctors' diagnostic ability, and relieve patients' burden.

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Contents

I. Introduction

As a common kidney disease in children, hydronephrosis is generally congenital [1], [2] and has increasing morbidity above 1% [3], [4]. Ureteropelvic junction obstruction (UPJO) is an obstruction at or along the pelvic–ureteral junction and is the main cause of children's hydronephrosis [5]. It can result in symptoms such as nausea and vomiting, abdominal pain, abdominal mass, urinary tract infection, hematuria, uremia, hypertension, and other progressive loss of renal function, such as uremia or even renal rupture.

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