Trying to Combat Inadequate Health Care Using NARS,

a General Purpose Reasoning System

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SUMMARY:

Lack of health care is a problem seen worldwide, in both third world and first world nations. Many say that the solution is a relatively easy one, simply make more doctors. In reality though, increasing the amount of doctors does not solve anything, it is merely a deviation from the actual solution, which involves finding a system of health care that works. Living in the richest first world country in the world, it is more important to implement a solution for developing countries because that is where it is needed the most. The objective of this project is to develop a method to assist doctors in diagnosing patients using NARS, a general purpose reasoning system. Working alongside Pei Wang, the producer of NARS, I hope to produce a subset of his system that is able to identify a patient’s problem without the immediate need for a doctor to make the diagnosis. How is this even possible and why it is different from other systems that have already been developed? This is possible because information will be input into the system, the way the system responds to the information will be evaluated, and the output of information will be manipulated to the point where the information is similar to what a doctor might say. Simply put, the process would be along the lines of a patient inputting his/her symptoms, NARS processing that information, and subsequently NARS providing a diagnosis. This project will seek to provide health care in a revolutionary way that does not eliminate the need for doctors, but rather helps to assist in gathering information regarding the patient’s history and the reason for a specific doctor’s visit.

After working on my project for two years now, although the research has become more complicated in different view it has become easier because I am more comfortable and know exactly what I want to do and in what direction I would like my research to proceed in. The specific focus of my research will be to test as many case studies as possible in order to make sure that NARS will produce accurate results and to alter NARS if need be in order to produce better results. After this, I hope to receive feedback from actual doctors and compare their input with the results we have and alter NARS as needed. Lastly, I would like to have a prototype of the program finished that could theoretically be used. In order to launch my research, I will use resources from the library at Temple Medical School to gather real case studies and apply them to the program.

SIMPLE CASES

CASE 1:

INPUT:

<{John-Doe} --> [runny-nose]>.

John Doe has a runny nose

<[runny-nose] --> [flu-symptom]>.

Runny nose is a flu symptom

<flu-patient --> [flu-symptom]>.

A flu patient has flu symptoms.

<(\*,{Tamiflu}, flu-patient) --> treatment>.

Tamiflu is treatment for a flu-patient

OUTPUT:

<(\*,{Tamiflu},{John-Doe}) --> treatment>. %1.00;0.34%

Tamiflu is treatment for John Doe

STEP-BY-STEP PROCEDURE:

\*\*\* step 1 [deduction]

  IN: <{John-Doe} --> [runny-nose]>. %1.00;0.90% {0 : 1}

  IN: <[runny-nose] --> [flu-symptom]>. %1.00;0.90% {0 : 2}

1

OUT: <{John-Doe} --> [flu-symptom]>. %1.00;0.81% {1 : 2;1}

\*\*\* step 2 [abduction]

  IN: <{John-Doe} --> [flu-symptom]>. %1.00;0.81% {0 : 1}

  IN: <flu-patient --> [flu-symptom]>. %1.00;0.90% {0 : 2}

1

OUT: <{John-Doe} --> flu-patient>. %1.00;0.42% {1 : 1;2}

\*\*\* step 3 [deduction]

  IN: <{John-Doe} --> flu-patient>. %1.00;0.42% {0 : 1}

  IN: <(\*,{Tamiflu},flu-patient) --> treatment>. %1.00;0.90% {0 : 2}

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 OUT: <(\*,{Tamiflu},{John-Doe}) --> treatment>. %1.00;0.34% {51 : 2;1}

CASE 2:

INPUT:

<{John-Doe} --> [sore-throat]>.

John Doe has a sore throat

<[sore-throat] --> [flu-symptom]>.

Sore throat is a flu symptom.

OUTPUT:

<{John-Doe} --> [flu-symptom]>. %1.00;0.81% {150 : 1;2}

John-Doe is a flu symptom.

   
 STEP-BY-STEP PROCEDURE:

\*\*\* step 1 [deduction]

  IN: <{John-Doe} --> [sore-throat]>. %1.00;0.90% {0 : 1}

  IN: <[sore-throat] --> [flu-symptom]>. %1.00;0.90% {0 : 2}

1

OUT: <{John-Doe} --> [flu-symptom]>. %1.00;0.81% {1 : 2;1}

CASE 3:

INPUT:

<{John-Doe} --> [runny-nose]>.

John Doe has a runny nose.

< flu-patient --> [runny-nose] >. %0.90;0.95%

A flu patient has a runny nose.

<cold-patient --> [runny-nose] >. %1.00;0.95%

A cold patient has a runny nose.

<allergy-patient --> [runny-nose]>. %1.00;0.80%

An allergy patient has a runny nose.

OUTPUT:

<{John-Doe} --> flu-patient>. %1.00;0.43%

John Doe is a flu patient.

<{John-Doe} --> cold-patient>. %1.00;0.46%

John Doe is a cold patient.

<{John-Doe} --> allergy-patient>. %1.00;0.42%

John Doe is an allergy patient.

STEP-BY-STEP PROCEDURE:

\*\*\* step 1

  IN: <{John-Doe} --> [runny-nose]>. %1.00;0.90% {0 : 1}

  IN: <flu-patient --> [runny-nose]>. %0.90;0.95% {0 : 2}

1

OUT: <{John-Doe} --> flu-patient>. %1.00;0.43% {1 : 1;2}

\*\*\* step 2

  IN: <{John-Doe} --> [runny-nose]>. %1.00;0.90% {0 : 1}

  IN: <cold-patient --> [runny-nose]>. %1.00;0.95% {0 : 2}

1

OUT: <{John-Doe} --> cold-patient>. %1.00;0.46% {1 : 1;2}

\*\*\* step 3

    IN: <{John-Doe} --> [runny-nose]>. %1.00;0.90% {0 : 1}

  IN: <allergy-patient --> [runny-nose]>. %1.00;0.80% {0 : 2}

1

OUT: <{John-Doe} --> allergy-patient>. %1.00;0.42% {1 : 1;2}

CASE 4

INPUT:

<{John-Doe} --> [runny-nose]>.

John Doe has a runny nose.

<{John-Doe} --> [headache]>.

John Doe has a headache.

<{John-Doe} --> [sore-throat]>.

John Doe has a sore throat.

<{flu-patient} --> [runny-nose]>.

A flu patient has a runny nose.

<{flu-patient} --> [headache]>.

A flu patient has a headache.

<{flu-patient} --> [sore-throat]>.

A flu patient has a sore throat.

OUTPUT:

<{John-Doe} <-> {flu-patient}>. %1.00;0.71% {6948 : 6;4;5;1;3;2}

John Doe is a flu patient.

STEP BY STEP PROCEDURE:

\*\*\* step 1

  IN: <{John-Doe} --> [runny-nose]>. %1.00;0.90% {0 : 1}

  IN: <{flu-patient} --> [runny-nose]>. %1.00;0.90% {0 : 2}

1

OUT: <{John-Doe} --> {flu-patient}>. %1.00;0.45% {3030 : 2;1}

\*\*\* step 2

  IN: <{John-Doe} --> [headache]>. %1.00;0.90% {0 : 1}

  IN: <{flu-patient} --> [headache]>. %1.00;0.90% {0 : 2}

1

OUT: <{John-Doe} --> {flu-patient}>. %1.00;0.45% {7241 : 1;2}

\*\*\* step 3

  IN: <{John-Doe} --> [sore-throat]>. %1.00;0.90% {0 : 1}

  IN: <{flu-patient} --> [sore-throat]>. %1.00;0.90% {0 : 2}

1

OUT: <{John-Doe} --> [flu-patient]>. %1.00;0.45% { 2;1}

CASE 5

INPUT:

<{John-Doe} --> [runny-nose]>.

John Doe has a runny nose.

<{John-Doe} --> [chest-pain]>.

John Doe has chest pain.

<[runny-nose] --> [flu-patient]>.

Runny nose is a symptom of a flu patient.

OUTPUT:

OUT: <{John-Doe} --> [flu-patient]>. %1.00;0.81% {989 : 1;3}

John Doe is a flu patient.

STEP-BY-STEP PROCEDURE:

\*\*\* step 1 [deduction]

IN: <{John-Doe} --> [runny-nose]>.

IN: <{John-Doe} --> [chest-pain]>.

OUT: <{John-Doe} --> [chest-pain,runny-nose]>. %1.00;0.81% {1123 : 1;2}

\*\*\* step 2 [abduction]

IN: <{John-Doe} --> [chest-pain,runny-nose]>. %1.00;0.81% {1123 : 1;2}

IN: <[runny-nose] --> [flu-patient]>.

OUT: <{John-Doe} --> [flu-patient]>. %1.00;0.81%

CASE 6

INPUT:

<{John-Doe} --> [runny-nose]>.

John Doe has a runny nose.

<{John-Doe} --> [fever]>.

John Doe has a fever.

<{John-Doe} --> [back-pain]>.

John Doe has back pain.

OUTPUT:

<{John-Doe} --> [runny-nose, fever]>. %1.00;0.81%

John Doe has a runny nose and a fever.

STEP-BY-STEP PROCEDURE:

\*\*\*Step 1

IN: <{John-Doe} --> [runny-nose]>.

IN: <{John-Doe} --> [fever]>.

OUT: <{John-Doe} --> [runny-nose, fever]>. %1.00;0.81%

\*\*\*Step 2

IN: <{John-Doe} --> [runny-nose, fever]>. %1.00;0.81%

IN: <{John-Doe} --> [back-pain]>.

OUT: <<{John-Doe} --> [back-pain]> ==> {John-Doe} --> [fever,runny-nose]>>. %1.00;0.42% {10981 : 2;1}