Artificial Intelligence Part 6

Neural Network Software
Private Const n As Integer = 4 'Number of components in an input vector.
Private Const m As Integer = 3 'Max number of clusters to be formed.
Private Const VIGILANCE As Double = 0.4
Private Const CR As String = Chr(13) + Chr(10)

Private Const PATTERNS As Integer = 7
Private Const TRAINING_PATTERNS As Integer = 4 'Must not be more than PATTERNS.
Private Pattern As Integer(,) = New Integer(,) {{1, 1, 0, 0},
{0, 0, 0, 1},
{1, 0, 0, 0},
{0, 0, 1, 1},
{0, 1, 0, 0},
{0, 0, 1, 0},
{1, 0, 1, 0}}

Private bw(m - 1, n - 1) As Double 'Bottom-up weights.
Private tw(m - 1, n - 1) As Double 'Top-down weights.

Private F1a(n - 1) As Integer 'Input layer.
Private F1b(n - 1) As Integer 'Interface layer.
Private F2(m - 1) As Double

Private Sub ART1()
Dim i, j, VecNum, InputSum, ActivationSum, F2Max As Integer
Dim Reset As Boolean

Text1.Text += "Begin ART1:" + CR + CR
For VecNum = 0 To PATTERNS - 1
  Text1.Text += "Vector: " + CStr(VecNum) + CR + CR

  'Initialize F2 layer activations to 0.0
  For i = 0 To m - 1
    F2(i) = 0.0
  Next i

  'Compute input sum
  For j = 0 To n - 1
    InputSum = InputSum + Pattern(VecNum, j) * F1a(j)
  Next j

  'Compute activation sum
  For i = 0 To m - 1
    ActivationSum = ActivationSum + tw(i, j) * InputSum
  Next i

  'Compute net input
  For i = 0 To m - 1
    Reset = False
    If ActivationSum(i) > F2Max
      F2Max = ActivationSum(i)
      Reset = True
    End If
    If Reset Or ActivationSum(i) > VIGILANCE * (n + m)
      F2(i) = ActivationSum(i)
      F2Max = ActivationSum(i)
    End If
  Next i

  'Update bottom-up weights
  For i = 0 To m - 1
    For j = 0 To n - 1
      bw(i, j) = (bw(i, j) + tw(i, j) * InputSum) / (n + m + 1)
    Next j
  Next i

  'Update top-down weights
  For i = 0 To m - 1
    For j = 0 To n - 1
      tw(i, j) = tw(i, j) * (bw(i, j) / ActivationSum(i))
    Next j
  Next i

  'Update Interface layer
  For j = 0 To n - 1
    F1b(j) = F1b(j) * tw(F2Max, j) / ActivationSum(F2Max)
  Next j

Next VecNum

Text1.Text += "End ART1:" + CR + CR

End Sub
Artificial Intelligence Part 6

AI Software
## Artificial Intelligence Part 6

<table>
<thead>
<tr>
<th>Feature</th>
<th>Kairos</th>
<th>Amazon</th>
<th>Google</th>
<th>Microsoft</th>
<th>IBM</th>
<th>Affectiva</th>
<th>OpenCV</th>
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</thead>
<tbody>
<tr>
<td>Face Detection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Face Recognition (Image)</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Face Recognition (Video)</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
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<tr>
<td>Emotional Depth (%)</td>
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<td>x</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Emotions Present (Y/N)</td>
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<td>✓</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
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<tr>
<td>Age &amp; Gender</td>
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<td>✓</td>
<td>x</td>
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### Artificial Intelligence Part 6

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<tr>
<td>Face Recognition (Video)</td>
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<td>✗</td>
<td>✔️</td>
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<td>✗</td>
<td>✔️</td>
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<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
<td>✗</td>
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<td>✗</td>
<td>✔️</td>
<td>✗</td>
</tr>
</tbody>
</table>
Artificial Intelligence Part 6

AI Software

- Amazon
- DeepMind
- Google Cloud Platform
- IBM Watson
- Facebook
- Microsoft
Artificial Intelligence Part 6

AI Software
Artificial Intelligence Part 6

AI Software

[Image of AI software interface with various options and layers]
Artificial Intelligence Part 6

Perceptron in terms of a Biological Neuron

Neural Networks
Artificial Intelligence Part 6

Neural Networks

Fundamental unit of a Neural Network

Output function

weights

\[ \sum_{i=0}^{n} w_i x_i \]

\[ = w \cdot x \]

\[ output = \begin{cases} 1 & \text{if } \sum_{i=0}^{n} w_i x_i > 0 \\ -1 & \text{otherwise} \end{cases} \]
Adaptive Resonance Theory

Neural Nets
Adaptive Resonance Theory

“As we move freely through the world, we can attend to both familiar and novel objects, and can rapidly learn to recognize, test hypotheses about, and learn to name novel objects without unselectively disrupting our memories of familiar objects.”

Neural Nets
Adaptive Resonance Theory

“As we move freely through the world, we can attend to both familiar and novel objects, and can rapidly learn to recognize, test hypotheses about, and learn to name novel objects without unselectively disrupting our memories of familiar objects.”

Neural Nets
Adaptive Resonance Theory

ART 1
Adaptive Resonance Theory
Adaptive Resonance Theory

F1a(0) = Net Income => 10X loan amount
F1a(1) = Owns residence
F1a(2) = Current job => 5 years
F1a(3) = At current residence => 5 years
F1a(4) = Current debt <= ½ Net Income
F1a(5) = Blonde Hair
Adaptive Resonance Theory
Adaptive Resonance Theory
Adaptive Resonance Theory
Adaptive Resonance Theory

Windows Forms
Adaptive Resonance Theory
## Adaptive Resonance Theory

<table>
<thead>
<tr>
<th># Outputs</th>
<th>F2 Layer</th>
<th>Category</th>
<th>Input Array</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0,1.5,0.4,</td>
<td>0</td>
<td>1,1,1,0,0,0,</td>
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<tr>
<td></td>
<td>1,1,1,0,0,0,</td>
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<td>1,1,1,0,0,0,</td>
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<tr>
<td></td>
<td>0,0,0,1,1,1,</td>
<td>0</td>
<td>1,1,1,0,0,0,</td>
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<tr>
<td></td>
<td>1,1,1,1,1,1,</td>
<td>0</td>
<td>1,1,1,0,0,0,</td>
</tr>
</tbody>
</table>

### TW weights
- Balanced
- Triple
- Quad
- Random 2
- Random 3
- Random 4

<table>
<thead>
<tr>
<th>Input Array Type</th>
<th>BW weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balanced</td>
<td>0.5,0.5,0.5,0,0,0,</td>
</tr>
<tr>
<td>Triple</td>
<td>0,0,0,0,5,0.5,0.5,</td>
</tr>
<tr>
<td>Quad</td>
<td>0.14,0.14,0.14,0.14,0.14,0.14,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># Inputs</th>
<th>F1 Layer B</th>
<th>F1 Layer A</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0,0,0,1,1,1,</td>
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</tr>
</tbody>
</table>

### Status
- End of Program

- Start
Adaptive Resonance Theory

Demonstration
Adaptive Resonance Theory

Demonstration
Adaptive Resonance Theory

Demonstration
Adaptive Resonance Theory

Demonstration
Adaptive Resonance Theory

Demo Balanced Array
### Adaptive Resonance Theory

**Demo Triple1 Array**

<table>
<thead>
<tr>
<th># Outputs</th>
<th>F2 Layer TW weights</th>
<th>Category</th>
<th>Input Array</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1.3, 0, 0.2,</td>
<td>0</td>
<td>1, 1, 1, 0, 0, 0,</td>
</tr>
<tr>
<td></td>
<td>0, 1, 1, 0, 0, 0,</td>
<td>0</td>
<td>1, 1, 1, 0, 0, 0,</td>
</tr>
<tr>
<td></td>
<td>0, 0, 0, 1, 1, 1,</td>
<td>0</td>
<td>1, 1, 1, 0, 0, 0,</td>
</tr>
<tr>
<td></td>
<td>1, 1, 1, 1, 1, 1,</td>
<td>0</td>
<td>1, 1, 1, 0, 0, 0,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># Train</th>
<th>Vigilance</th>
<th>Input Array</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

**Input Array Type**
- Balanced
- Triple 1
- Triple 2
- Quad 1
- Random 2
- Random 3

**F1 Layer A**
- 0, 1, 1, 0, 0, 0,

**F1 Layer B**
- 0, 1, 1, 0, 0, 0,

**F2 Layer BW weights**
- 0, 0.66, 0.66, 0, 0, 0,
- 0, 0, 0, 0.5, 0.5, 0.5,
- 0.14, 0.14, 0.14, 0.14, 0.14, 0.14,

Status:
- End of Program

Start button
Adaptive Resonance Theory

Demo Triple 2 array
Adaptive Resonance Theory

Demo Triple 2 array
Adaptive Resonance Theory

Demo Quad 1 array
Adaptive Resonance Theory

Demo Quad 1 array
Adaptive Resonance Theory

Demo Quad 1 array
Adaptive Resonance Theory

Demo Quad 1 array
Adaptive Resonance Theory

Demo Quad 1 array
Break
Visual Studio 2017

Integrated Development Environment
IDE
Visual Studio 2017

Languages

Visual Basic
C++
C#
F#
Python
JavaScript
Visual Studio 2017


How do I get it?
Welcome to a new way to install Visual Studio! In our newest version, we've made it easier for you to select and install just the features you need. We've also reduced the minimum footprint of Visual Studio so that it installs more quickly and with less system impact than ever before.

Want to know more about what else is new in this version? See our release notes.

Ready to install? We'll walk you through it, step-by-step.

Step 1 - Make sure your computer is ready for Visual Studio

Before you begin installing Visual Studio:

1. Check the system requirements. These requirements help you know whether your computer supports Visual Studio 2017.
2. Apply the latest Windows updates. These updates ensure that your computer has both the latest security updates and the required system components for Visual Studio.
3. Reboot. The reboot ensures that any pending installs or updates don't hinder the Visual Studio install.
4. Free up space. Remove unneeded files and applications from your %SystemDrive% by, for example, running the Disk Cleanup app.

VS 2017 Web Site
Visual Studio 2017

Supported Operating Systems

- Windows 10 version 1507 or higher: Home, Professional, Education, and Enterprise (LTSC and S are not supported)
- Windows Server 2016: Standard and Datacenter
- Windows 8.1 (with Update 2919355): Core, Professional, and Enterprise
- Windows Server 2012 R2 (with Update 2919355): Essentials, Standard, Datacenter
- Windows 7 SP1 (with latest Windows Updates): Home Premium, Professional, Enterprise, Ultimate

Hardware

- 1.8 GHz or faster processor. Dual-core or better recommended
- 2 GB of RAM; 4 GB of RAM recommended (2.5 GB minimum if running on a virtual machine)
- Hard disk space: up to 130 GB of available space, depending on features installed: typical installations require 20-50 GB of free space.
- Video card that supports a minimum display resolution of 720p (1280 by 720): Visual Studio will work best at a resolution of WXGA (1366 by 768) or higher.

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Visual Studio is available in English, Chinese (Simplified), Chinese (Traditional), Czech, French, German, Italian, Japanese, Korean, Polish, Portuguese (Brazil), Russian, Spanish, and Turkish.
Visual Studio 2017

Click the Button!
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- Enterprise: Scalable, end-to-end solution for teams of any size

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Opening vs_community.exe
You have chosen to open:
   vs_community.exe
which is: Binary File (1.2 MB)
from: https://download.visualstudio.microsoft.com
Would you like to save this file?

Save File  Cancel

Install the Installer!
Visual Studio 2017

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Click Continue
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The Installer is Installed!
Visual Studio 2017

Select your components
Visual Studio 2017

It even works for Linux!
Install VS 2017
Visual Studio 2017

Visual Studio Installer

Products

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Release notes
Modify  Launch  More

Available

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Install

Visual Studio

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Maybe Later
Visual Studio 2017

Select options
Visual Studio 2017

The Start Screen

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Open

Get code from a remote version control system or open something on your local drive.
Checkout from:
- Visual Studio Team Services
- Open Project / Solution
- Open Folder

Recent

This month

Solution1.sln
C:\(User)\ThomasTe\source\repos\Solution1

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- Visual Studio
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Visual Studio 2017

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