<?xml version="1.0" encoding="UTF-8"?>\n<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">\n<html xmlns="http://www.w3.org/1999/xhtml" lang="en">\n\n<head>\n <title>[1810.10941] Alzheimer&#39;s Disease Diagnosis Based on Cognitive Methods in Virtual Environments and Emotions Analysis</title>\n <link rel="shortcut icon" href="/favicon.ico" type="image/x-icon" />\n <link rel="stylesheet" type="text/css" media="screen" href="//static.arxiv.org/css/arXiv.css?v=20170424" />\n \n <!-- Piwik -->\n <script type="text/javascript">\n var \_paq = \_paq || [];\n \_paq.push(["setDomains", ["\*.arxiv.org"]]);\n \_paq.push([\'trackPageView\']);\n \_paq.push([\'enableLinkTracking\']);\n (function() {\n var u = "//webanalytics.library.cornell.edu/";\n \_paq.push([\'setTrackerUrl\', u + \'piwik.php\']);\n \_paq.push([\'setSiteId\', 538]);\n var d = document,\n g = d.createElement(\'script\'),\n s = d.getElementsByTagName(\'script\')[0];\n g.type = \'text/javascript\';\n g.async = true;\n g.defer = true;\n g.src = u + \'piwik.js\';\n s.parentNode.insertBefore(g, s);\n })();\n </script>\n <!-- End Piwik Code -->\n <script type="text/javascript" src="https://culibrary.atlassian.net/s/d41d8cd98f00b204e9800998ecf8427e-T/-w6uc8u/b/16/a44af77267a987a660377e5c46e0fb64/\_/download/batch/com.atlassian.jira.collector.plugin.jira-issue-collector-plugin:issuecollector/com.atlassian.jira.collector.plugin.jira-issue-collector-plugin:issuecollector.js?locale=en-US&collectorId=7a8da419"></script>\n<script type="text/javascript">window.ATL\_JQ\_PAGE\_PROPS = {\n "triggerFunction": function(showCollectorDialog) {\n //Requires that jQuery is available!\n jQuery("#feedback-button").click(function(e) {\n e.preventDefault();\n showCollectorDialog();\n });\n },\n fieldValues: {\n "components": ["15700"], // Browse component.\n "versions": ["14132"], // Release browse-0.1\n "customfield\_11401": window.location.href\n }\n };\n</script><link rel="stylesheet" media="screen" type="text/css" href="/bibex/bibex.css?20181010"/>\n <script src="//static.arxiv.org/js/mathjaxToggle.min.js" type="text/javascript"></script>\n <meta name="citation\_title" content="Alzheimer&#39;s Disease Diagnosis Based on Cognitive Methods in Virtual Environments and Emotions Analysis"/>\n <meta name="citation\_author" content="Montenegro, Juan Manuel Fernández"/>\n <meta name="citation\_date" content="2018/10/25"/>\n <meta name="citation\_online\_date" content="2018/10/25"/>\n <meta name="citation\_pdf\_url" content="https://arxiv.org/pdf/1810.10941"/>\n <meta name="citation\_arxiv\_id" content="1810.10941"/>\n</head>\n\n<body class="with-cu-identity">\n <noscript><img src="//webanalytics.library.cornell.edu/piwik.php?idsite=538&amp;rec=1" style="border:0;" alt="" /></noscript>\n <div id="cu-identity">\n <div id="cu-logo">\n <a id="insignia-link" href="http://www.cornell.edu/"><img src="//static.arxiv.org/icons/cu/cul\_signature\_unstyled.gif" alt="Cornell University" width="283" height="76" border="0" /></a>\n <div id="unit-signature-links">\n <a id="cornell-link" href="http://www.cornell.edu/">Cornell University</a>\n <a id="unit-link" href="http://www.library.cornell.edu/">Library</a>\n </div>\n </div>\n <div id="support-ack">\n <a href="https://confluence.cornell.edu/x/ALlRF">We gratefully acknowledge support from<br/>the Simons Foundation<br /> and member institutions</a>\n </div>\n </div>\n\n <div id="header" >\n \n <h1><a href="/">arXiv.org</a> &gt; <a href="/list/cs/recent">cs</a> &gt; arXiv:1810.10941</h1>\n <div id="search">\n <form id="search-arxiv" method="get" action="https://arxiv.org/search">\n\n <div class="wrapper-search-arxiv">\n <input class="keyword-field" type="text" name="query" placeholder="Search or Article ID" />\n\n <div class="filter-field">\n <select name="searchtype">\n <option value="all">All fields</option>\n <option value="title">Title</option>\n <option value="author">Author(s)</option>\n <option value="abstract">Abstract</option>\n <option value="comments">Comments</option>\n <option value="journal\_ref">Journal reference</option>\n <option value="acm\_class">ACM classification</option>\n <option value="msc\_class">MSC classification</option>\n <option value="report\_num">Report number</option>\n <option value="paper\_id">arXiv identifier</option>\n <option value="doi">DOI</option>\n <option value="orcid">ORCID</option>\n <option value="author\_id">arXiv author ID</option>\n <option value="help">Help pages</option>\n <option value="full\_text">Full text</option>\n </select>\n </div>\n <input class="btn-search-arxiv" value="" type="submit">\n <div class="links">(<a href="https://arxiv.org/help">Help</a> | <a href="https://arxiv.org/search/advanced">Advanced search</a>)</div>\n </div>\n </form>\n </div>\n\n </div>\n\n <div id="content">\n <!--\nrdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"\n xmlns:dc="http://purl.org/dc/elements/1.1/"\n xmlns:trackback="http://madskills.com/public/xml/rss/module/trackback/">\n <rdf:Description\n rdf:about="/abs/1810.10941"\n dc:identifier="/abs/1810.10941"\n dc:title="Alzheimer&#39;s Disease Diagnosis Based on Cognitive Methods in Virtual Environments and Emotions Analysis"\n trackback:ping="/trackback/1810.10941" />\n </rdf:RDF>\n-->\n<div id="abs">\n <div class="extra-services">\n <div class="full-text">\n <span class="descriptor">Full-text links:</span>\n <h2>Download:</h2>\n <ul>\n <li><a href="/pdf/1810.10941" accesskey="f">PDF</a></li>\n <li><a href="/format/1810.10941">Other formats</a></li></ul>\n <div class="abs-license"><a href="http://creativecommons.org/licenses/by-nc-sa/4.0/" title="Rights to this article"><img src="https://arxiv.org/icons/licenses/by-nc-sa-4.0.png"/></a></div>\n </div>\n <!--end full-text-->\n <div class="browse">\n <h3>Current browse context:</h3>\n <div class="current">cs.CV</div>\n\n <div class="prevnext">\n\n <span class="arrow">\n <a href="/prevnext?site=arxiv.org&amp;id=1810.10941&amp;function=prev&amp;context=cs.CV"\n accesskey="p" title="previous in cs.CV (accesskey p)">&lt;&nbsp;prev</a>\n </span>&nbsp;|&nbsp;\n\n \n <span class="arrow">\n <a href="/prevnext?site=arxiv.org&amp;id=1810.10941&amp;function=next&amp;context=cs.CV" accesskey="n"\n title="next in cs.CV (accesskey n)">next&nbsp;&gt;</a>\n </span><br/>\n </div><div class="list">\n <a href="/list/cs.CV/new">new</a>&nbsp;|\n <a href="/list/cs.CV/recent">recent</a>&nbsp;|\n <a href="/list/cs.CV/1810">1810</a>\n </div><h3>Change to browse by:</h3>\n <div class="switch">\n \n <a href="/abs/1810.10941?context=cs">cs</a>\n \n <br/>\n \n <a href="/abs/1810.10941?context=q-bio">q-bio</a>\n \n <br/>\n \n <span class="subclass"><a href="/abs/1810.10941?context=q-bio.NC">q-bio.NC</a></span>\n \n <br/>\n \n </div>\n \n </div>\n\n <div class="extra-ref-cite">\n <h3>References &amp; Citations</h3>\n <ul>\n \n <li><a href="http://adsabs.harvard.edu/cgi-bin/bib\_query?arXiv:1810.10941">NASA ADS</a></li>\n </ul>\n </div>\n\n <div class="bookmarks">\n <div class="what-is-this"><h3>Bookmark</h3> (<a href="https://arxiv.org/help/social\_bookmarking">what is this?</a>)</div><a href="/ct?url=http%3A%2F%2Fwww.citeulike.org%2Fposturl%3Furl%3Dhttps%3A%2F%2Farxiv.org%2Fabs%2F1810.10941&amp;v=d004f528"\n title="Bookmark on CiteULike">\n <img src="//static.arxiv.org/icons/social/citeulike.png"\n alt="CiteULike logo" />\n </a>\n <a href="/ct?url=http%3A%2F%2Fwww.bibsonomy.org%2FBibtexHandler%3FrequTask%3Dupload%26url%3Dhttps%3A%2F%2Farxiv.org%2Fabs%2F1810.10941%26description%3DAlzheimer%27s+Disease+Diagnosis+Based+on+Cognitive+Methods+in+Virtual+Environments+and+Emotions+Analysis&amp;v=14f31960"\n title="Bookmark on BibSonomy">\n <img src="//static.arxiv.org/icons/social/bibsonomy.png"\n alt="BibSonomy logo"/>\n </a>\n <a href="/ct?url=https%3A%2F%2Fwww.mendeley.com%2Fimport%2F%3Furl%3Dhttps%3A%2F%2Farxiv.org%2Fabs%2F1810.10941&amp;v=b366f27e"\n title="Bookmark on Mendeley">\n <img src="//static.arxiv.org/icons/social/mendeley.png"\n alt="Mendeley logo"/>\n </a>\n <a href="/ct?url=https%3A%2F%2Freddit.com%2Fsubmit%3Furl%3Dhttps%3A%2F%2Farxiv.org%2Fabs%2F1810.10941%26title%3DAlzheimer%27s+Disease+Diagnosis+Based+on+Cognitive+Methods+in+Virtual+Environments+and+Emotions+Analysis&amp;v=05d3160a"\n title="Bookmark on Reddit">\n <img src="//static.arxiv.org/icons/social/reddit.png"\n alt="Reddit logo"/>\n </a>\n <a href="/ct?url=http%3A%2F%2Fsciencewise.info%2Fbookmarks%2Fadd%3Furl%3Dhttps%3A%2F%2Farxiv.org%2Fabs%2F1810.10941&amp;v=86fe08c9"\n title="Bookmark on ScienceWISE">\n <img src="//static.arxiv.org/icons/social/sciencewise.png"\n alt="ScienceWISE logo"/>\n </a>\n</div>\n </div>\n <!--end extra-services-->\n\n <div class="leftcolumn">\n <div class="subheader">\n <h1>Computer Science > Computer Vision and Pattern Recognition</h1>\n </div>\n <h1 class="title mathjax"><span class="descriptor">Title:</span>Alzheimer&#39;s Disease Diagnosis Based on Cognitive Methods in Virtual Environments and Emotions Analysis</h1>\n <div class="authors"><span class="descriptor">Authors:</span><a href="https://arxiv.org/search/cs?searchtype=author&amp;query=Montenegro%2C+J+M+F">Juan Manuel Fernández Montenegro</a>\n </div>\n\n <div class="dateline">(Submitted on 25 Oct 2018)</div>\n\n <blockquote class="abstract mathjax"><span class="descriptor">Abstract:</span> Dementia is a syndrome characterised by the decline of different cognitive\nabilities. Alzheimer&#39;s Disease (AD) is the most common dementia affecting\ncognitive domains such as memory and learning, perceptual-motion or executive\nfunction. High rate of deaths and high cost for detection, treatments and\npatient&#39;s care count amongst its consequences. Early detection of AD is\nconsidered of high importance for improving the quality of life of patients and\ntheir families. The aim of this thesis is to introduce novel non-invasive early\ndiagnosis methods in order to speed the diagnosis, reduce the associated costs\nand make them widely accessible. Novel AD&#39;s screening tests based on virtual\nenvironments using new immersive technologies combined with advanced Human\nComputer Interaction (HCI) systems are introduced. Four tests demonstrate the\nwide range of screening mechanisms based on cognitive domain impairments that\ncan be designed using virtual environments. The use of emotion recognition to\nanalyse AD symptoms has been also proposed. A novel multimodal dataset was\nspecifically created to remark the autobiographical memory deficits of AD\npatients. Data from this dataset is used to introduce novel descriptors for\nElectroencephalogram (EEG) and facial images data. EEG features are based on\nquaternions in order to keep the correlation information between sensors,\nwhereas, for facial expression recognition, a preprocessing method for motion\nmagnification and descriptors based on origami crease pattern algorithm are\nproposed to enhance facial micro-expressions. These features have been proved\non classifiers such as SVM and Adaboost for the classification of reactions to\nautobiographical stimuli such as long and short term memories.\n</blockquote>\n <!--CONTEXT-->\n <div class="metatable">\n <table summary="Additional metadata">\n <tr>\n <td class="tablecell label">Comments:</td>\n <td class="tablecell comments mathjax">PhD Thesis 2018</td>\n </tr>\n <tr>\n <td class="tablecell label">Subjects:</td>\n <td class="tablecell subjects"><span class="primary-subject">Computer Vision and Pattern Recognition (cs.CV)</span>; Neurons and Cognition (q-bio.NC)</td>\n </tr><tr>\n <td class="tablecell label">Cite as:</td>\n <td class="tablecell arxivid"><a href="https://arxiv.org/abs/1810.10941">arXiv:1810.10941</a> [cs.CV]</td>\n </tr>\n <tr>\n <td class="tablecell label">&nbsp;</td>\n <td class="tablecell arxividv">(or <span class="arxivid">\n <a href="https://arxiv.org/abs/1810.10941v1">arXiv:1810.10941v1</a> [cs.CV]</span> for this version)\n </td>\n </tr>\n </table>\n </div>\n <div class="submission-history">\n <h2>Submission history</h2> From: Juan Manuel Fernandez Montenegro JMFMontenegro [<a href="/show-email/eb6f2d74/1810.10941">view email</a>]\n <br/><b>[v1]</b>\nThu, 25 Oct 2018 15:56:51 UTC (4,380 KB)<br/></div>\n <div class="endorsers"><a href="/auth/show-endorsers/1810.10941">Which authors of this paper are endorsers?</a> | <a id="mathjax\_toggle" href="javascript:setMathjaxCookie()">Disable MathJax</a> (<a href="https://arxiv.org/help/mathjax">What is MathJax?</a>)</div>\n <script type="text/javascript" language="javascript">mathjaxToggle();</script>\n <script src="/bibex/bibex.js?20181010" type="text/javascript" defer></script>\n \n </div>\n <!--end leftcolumn-->\n</div>\n\n </div>\n <div id="footer">\n <div class="footer-text">\n <p>Link back to: <a href="https://arxiv.org/">arXiv</a>, <a href="/form">form interface</a>, <a href="https://arxiv.org/help/contact">contact</a>.&nbsp;&nbsp;<span class="help" style="display: inline-block; float: right"><a href="https://confluence.cornell.edu/x/MjmLFQ">Browse v0.1 released 2018-10-22</a>&nbsp;&nbsp;<button class="button is-small" id="feedback-button">Feedback?</button></span></p>\n <p class="a11y-text" style="margin: 1em 0; padding-top: 1em; border-top: 1px solid #ccc">If you have a disability and are having trouble accessing information on this website or need materials in an alternate format, contact <a href="mailto:web-accessibility@cornell.edu">web-accessibility@cornell.edu</a> for assistance.</p>\n </div>\n <div class="social"><a href="https://twitter.com/arxiv"><img src="//static.arxiv.org/icons/twitter\_logo\_blue.png" alt="Twitter" title="Follow arXiv on Twitter"/></a></div>\n </div>\n</body>\n\n</html>